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THE NATIONAL GEOGRAPHIC MAGAZINE

HOW THE WORLD IS FED

By William Joseph Showalter

AT THE present juncture, while great issues of world politics hang critically upon the effort of the Entente Powers in the European war to force the Central Powers into submission by drawing around them the steel ring of war and the cold ring of hunger, it is more than interesting to take an inventory of the world's market basket, and to pause for a passing moment to see what effect war has had on the world's food supply in the past, what effect it is having today, and, if possible, to forecast its effect upon the future food problems of the earth.

If we go back one hundred years it will be discovered that France was facing almost the same problems then that Germany is facing today. England's fleet blockaded France's ports then just as they blockade Germany's today, and oversea foodstuffs had little chance to reach the French.

How far this went, and how great an effect it had on conditions in Napoleon's Empire, is revealed by the fact that sugar sold for two dollars a pound. And that the world is not sugar-hungry today is due to the steps taken by Napoleon to overcome the effect of the blockade on sugar. Years before, some Prussian scientists had been trying to get sugar from the beet, and, under the patronage of the King of Prussia, Frederick William III, succeeded in their task.

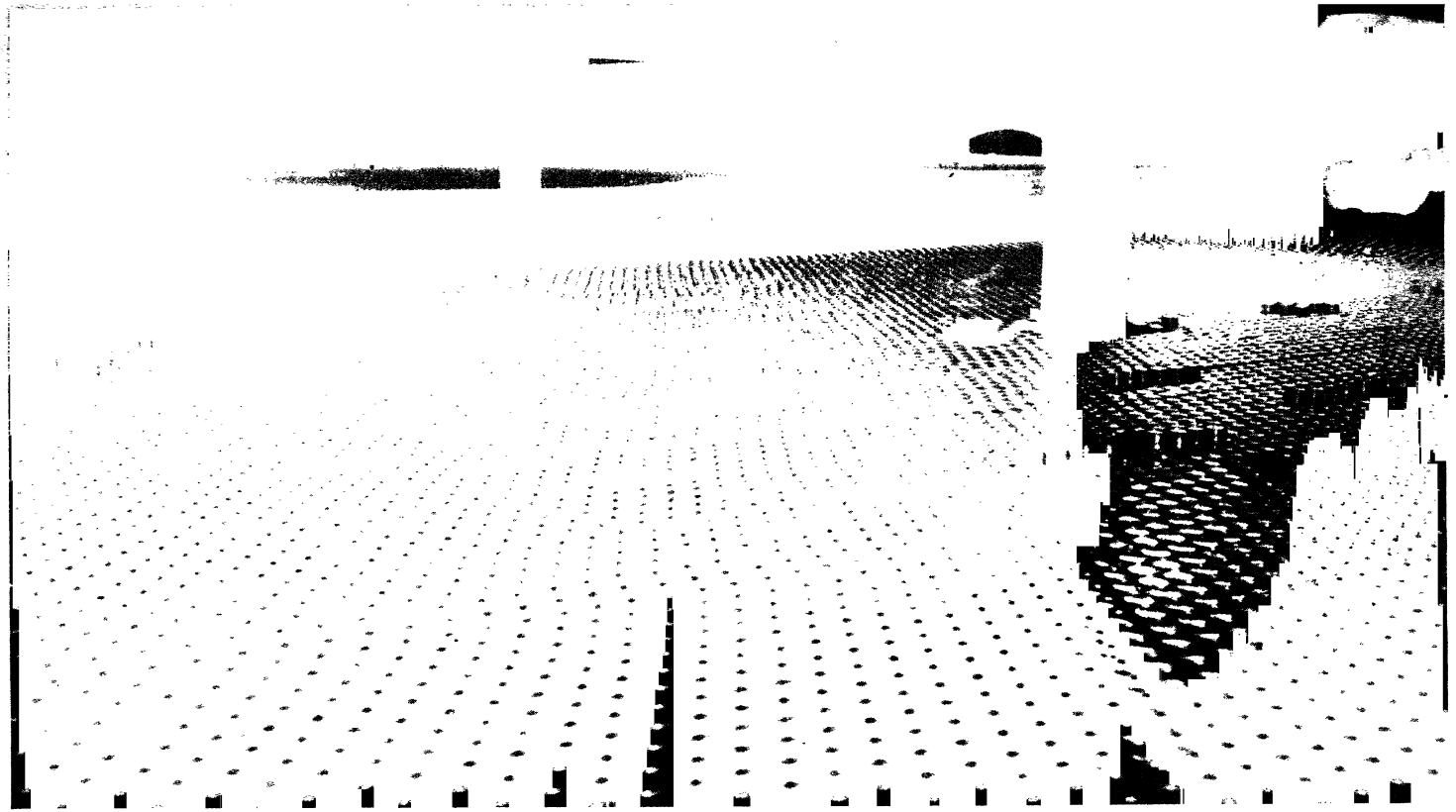
Napoleon borrowed their ideas, set up beet-sugar factories around Lille, and gave to the beet-sugar industry that impetus which has resulted in its development to a point where it yields half of the world's supply of sugar (see page 86).

WAR AND CANNED GOODS

The Little Corporal saw himself seriously embarrassed in the matter of food supplies for his army. He wanted something for his men besides things that were dried or smoked—a desire that was enhanced by his knowledge that millions of dollars in valuable but perishable foods were wasted because of the lack of adequate means of preserving them.

He therefore offered a prize of twelve thousand francs to any one who would devise a practicable method of preserving such foodstuffs. Such a method was quickly evolved, and out of it has grown the world's canning industry—one of the important steps that civilization has taken in the direction of insuring mankind against famine (see also page 66).

It is not improbable that the present war will bring to mankind new methods in the feeding of the race that will prove as important as those brought out by the Napoleonic wars. It has been announced lately that the Germans have devised a new synthetic method of producing protein. It is said that they feed yeast with a combination of sugar and nitrogen from the air, and thus secure that most important of all of the elements that enter into the world's diet—protein. Examples of protein are the whites of eggs, the



Photograph by Curtis & Miller

CANNED SALMON IN THE WAREHOUSE READY FOR DISTRIBUTION

Some of the most important advances man has made in his food supply have been the result of war. Napoleon's bounty brought about the development of the art of canning foods (see page 1). Before his day not even the scientist in his laboratory could "put up" a can of food; today there is not a rural housewife so unscientific as not to be able to do so. The commercial canneries of the United States alone now produce about twenty cans of fruit and vegetables and five pounds of canned fish and shellfish for every man, woman, and child in the country. And this takes no account of that vast quantity of fruits and vegetables canned by the millions of farmers' wives in their own homes. The tens of thousands of cans in this warehouse, which make the men in the middle background appear lost, give some idea of the magnitude of our fish consumption, which, however, is smaller per capita than that of most nations.

muscles of meats, the casein of milk, the gluten of flour, and the nitrogenous fats.

It may also happen that as a result of the war will come the utilization of other plant products than those now entering into direct use as human food. There are approximately half a million species of plants in the world, and yet only a few thousand of them are used at all for food, while only a few hundred of these are used to any important extent. Some of the plants which we now grow are expensive food-producers, some produce food that is difficult to digest, and some give a small yield per acre.

DEVELOPING NEW FOODS

We are constantly developing new foods. It is only little more than half a century since the tomato was a curiosity of the South, known as the "love apple," and used to scare the slaves, who thought it poisonous. Corn came to us from the Indians, and has become one of the leading cereal crops of the world. It is less than a century ago that the lima bean came to us from South America, and the potato was unknown to civilization before the white man went to Peru and Colombia (see page 42).

Today representatives of all of the leading nations are scouring the remote places of the earth for crops which promise to increase the world's total yield of food, as well as its per-acre production. In our own Department of Agriculture we have a division which has brought perhaps 40,000 different kinds of plants into the United States, many of them to be placed on trial as food-producers.

The Mission Fathers of our Southwest, who brought the olive and the date from the Mediterranean region, gave to California some of the richest olive and date orchards in the world, while a woman missionary, traveling in Brazil, sent us cuttings from which the great orange-growing industry of our country has been developed (see page 71).

FRUIT AND VEGETABLES HAVE BEEN WONDERFULLY IMPROVED

Not only is mankind gradually increasing the possible acreage for the growing of foodstuffs—and statistics indicate that only the most fertile third [illegible] world's potential food-producing [illegible]reage is under cultivation today—[illegible]he crops themselves are being constan[illegible] improved and their natural per-acre yield increased.

It is a far cry from the little old knotted and gnarled apples of a few centuries ago to the magnificent Stayman winesaps, York imperials, and Albemarle pippins of today; and it is also a far cry from the unimproved, small and hard peach of the olden days to the big, luscious Alberta of the present; nor is the change that has come over the potato since Burbank begun his experiments any less noted. Both in the animal and in the vegetable world a marked improvement is constantly taking place. Whether there will be further improvements as a result of the war in Europe remains to be seen.

WHAT OF THE FUTURE?

Many men are inclined to sound a pessimistic note as to the adequacy of the world's food supply for future generations, and, like Malthus a hundred years ago, are inclined to predict that the day has at last come when the human race must cease to expand its numbers, or else face inevitable hunger.

And when we consider how many mouths there are in this world to feed, and how much food it takes to satisfy them, little room is there to wonder at this note of pessimism.

The earth's population today reaches a grand total of about 1,700,000,000 souls. If they were all set down at a banquet it would require sixteen tables reaching around the globe to seat them. For every ounce of food they ate, the dinner-giver would have to provide 53,000 tons of provisions, and if the dinner were no more than a democratic dollar-a-plate affair, it would cost, in the aggregate, as much as it costs to run the United States government a year and a half.

Expressed in terms of annual consumption, the world's market basket is one that defies portrayal in weight and size. One is forced to cast around for new units of measurement to give a proper idea of its proportions. Assuming that the average inhabitant of the earth uses two pounds of provisions a



Photograph from U. S. Department of Agriculture

TOMATO PLANTS TRAINED ON TWINE TRELLISES

It is only a generation since the tomato was first accepted by civilization, and yet today millions of people regard it as an almost indispensable part of the kitchen vegetable supply. New Jersey is our leading tomato and asparagus producing State; New York leads in cabbage, onions, and sweet corn; Florida holds first place in the production of green beans, cucumbers, egg plant, and lettuce; California produces more cantaloupes and muskmelons than any other State, and Texas makes its bid for vegetable-producing fame by leading the procession as a producer



Photograph from Rev. B. H. Johns

A DAY'S RATIONS FOR 43 BOYS: TIENTSIN, NORTH CHINA

The food for one day (two meals) is, beginning at the left: bag of wheat flour for bread, 32 pounds; bottle of sesame seed oil; little basket of sea salt; two pounds of bean curd (in wicker ladle); large stone bowl of rice, 33 pounds, and several heads of Chinese cabbage. The bundle of dried grass at the right is the fuel for preparing it.

day, the total for the year would amount to a billion and a quarter tons. It would require a string of cars, carrying thirty tons to the car and reaching eight times around the earth, to haul this material.

THE AVERAGE RATION

The fact, however, is that the average inhabitant of the earth probably uses more than two pounds of provisions a day. The steerage passengers on English ships are allowed 2½ pounds each a day. Even the prisoner in the average jail gets more than 2 pounds; the Russian conscript 4 pounds; and the Austrian common soldier 2½ pounds a day.

Still another way to get an idea of the size of the world's food problem is to assume that the average individual consumes ten cents' worth of food daily. On this basis it would require the entire national wealth of the United States, the richest nation of all history, to pay the world's food bill for twenty-six months. For every cent per day per capita that the cost of living increases, more than $6,000,000,000 is added to the world's annual market-basket expense.

STARVATION STILL REMOTE

But when one considers the possibilities of future food production, it is difficult to have much faith in the prophecies of pessimism of these twentieth-century successors of Malthus (see also page 91).

For instance, in the United States we have 935,000,000 acres of arable land, only 400,000,000 of which are under cultivation. Yet, with less than half of our available land utilized, the United States produces one-sixth of the world's wheat, four-ninths of its corn, one-fourth of its oats, one-eighth of its cattle, one-third of its hogs, and one-twelfth of its sheep.

Even with the land now under cultivation, if we produced as much wheat per acre as England and Germany, we could supply the world with two-thirds of its flour. If we produced as much corn to the acre as they do, we could double the world's supply of that product.

Today the United States has a total



Photograph by Curtis & Miller

SHEEP IN AN IRRIGATION DISTRICT: WASHINGTON STATE

"Taking the world's supply of sheep, cattle, and hogs, and making proper allowances for less improved methods of stock-raising on other parts of the globe as compared with those of the United States, it appears that mankind at large uses in the neighborhood of 47,000,000,000 pounds of meat a year," which is about 49 pounds per capita, as compared with America's 172 pounds (see text, page 12).

cereal crop of 5,000,000,000 bushels. Were all of our arable land under cultivation and producing only according to our present standard, which is less than half as high as that of western Europe, we could add enough cereals to take care of an additional population the size of that of Europe (see also page 91).

LITTLE ROOM FOR PESSIMISM

When one has lived on land, as the writer has done, which, at the end of the Civil War, did not produce more than eight bushels of wheat and twenty bushels of corn to the acre, and has seen this land produce as high as forty-five bushels of wheat and a hundred bushels of corn, it is difficult to take any other than an optimistic view of the possibilities of American agriculture.

Not only are there infinite possibilities yet untouched in our own country, but also in most of the other countries of the earth as well. For instance, Russia, that land for which nature has done so much, endowing it with food-producing possibilities such as few other countries possess, has a wheat yield of only ten bushels to the acre.

When the day comes, as come it certainly will, that Russia produces as much per acre as Germany and England, and when the untold millions of acres of undeveloped land are opened up and settled, as they are destined to be, alone she can supply the world's present needs in cereals except rice and corn (see pages 24 and 25).

TROPICAL POSSIBILITIES

Nor is that all. Any one who has traveled through the tropics, studying the production of foodstuffs there at first hand, cannot fail to understand that vast potential food sources still lie untouched. The wonderful discoveries of Ross and Reed and their coadjutors, of the methods of preventing malaria and yellow fever, followed by the mastery of the secrets of the bubonic plague and beriberi, and the application of these lessons in Cuba, at Panama, and elsewhere in the tropical world, have made it possible for civilized man to open up gardens of plenty of which he never before dreamed.

Untold millions of acres of densest jungles are, so far as man is concerned, nothing more than lands of infinite richness wasting their sweetness upon the desert air of unutilized opportunities.

Not long ago I visited the ruins of Quirigua, in Guatemala. The United Fruit Company had set apart several hundred acres as a reservation for the protection of the ruins. The jungle forest of the reservation, bordering the banana clearings, towered like a green wall a hundred feet high, and the undergrowth was so dense that no man could penetrate it save by cutting his way through with a machete.

There I saw the contrast between the past and the future of the tropical world. The banana plantations, stretching for miles and miles up and down the Motaga River valley, were producing millions of bunches of bananas, where but a few years before had existed the same sort of jungle as that at Quirigua.

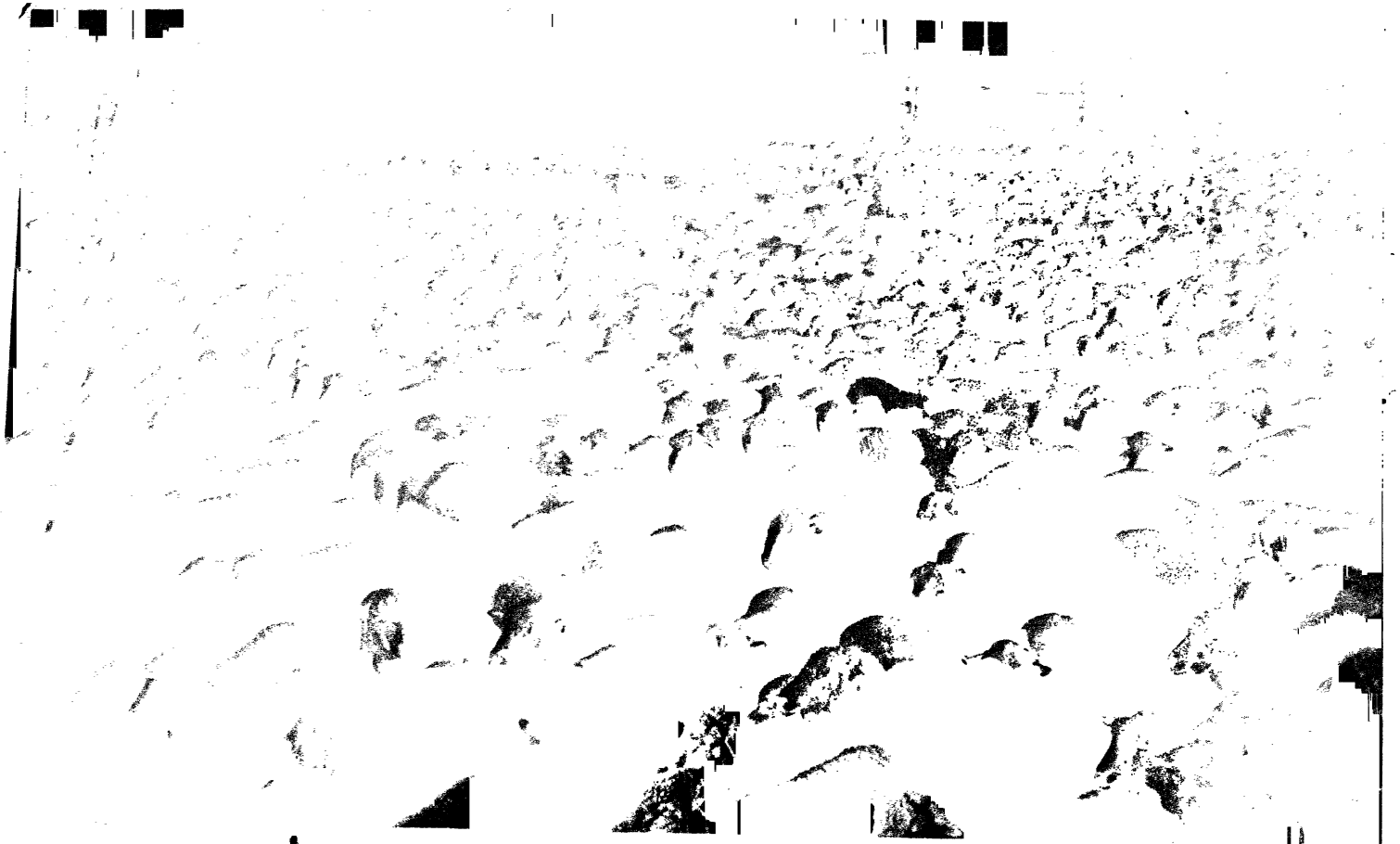
NEW PRODUCTS AVAILABLE

Not only are there vast millons of acres of potentially rich agricultural lands still awaiting development, and not only is it certain that the production per acre of those lands now under cultivation will be vastly increased, but new products are an inevitable prospect of the future.

When one travels in tropical countries he finds that banana flour makes an excellent substitute for wheat flour; and if the day ever comes when the wheat and the rye and the barley crops do not yield sufficient bread, there are hundreds of millions of acres of potential banana land which will produce many-fold as much banana flour to the acre as we are able to get today of wheat flour from our wheat lands.

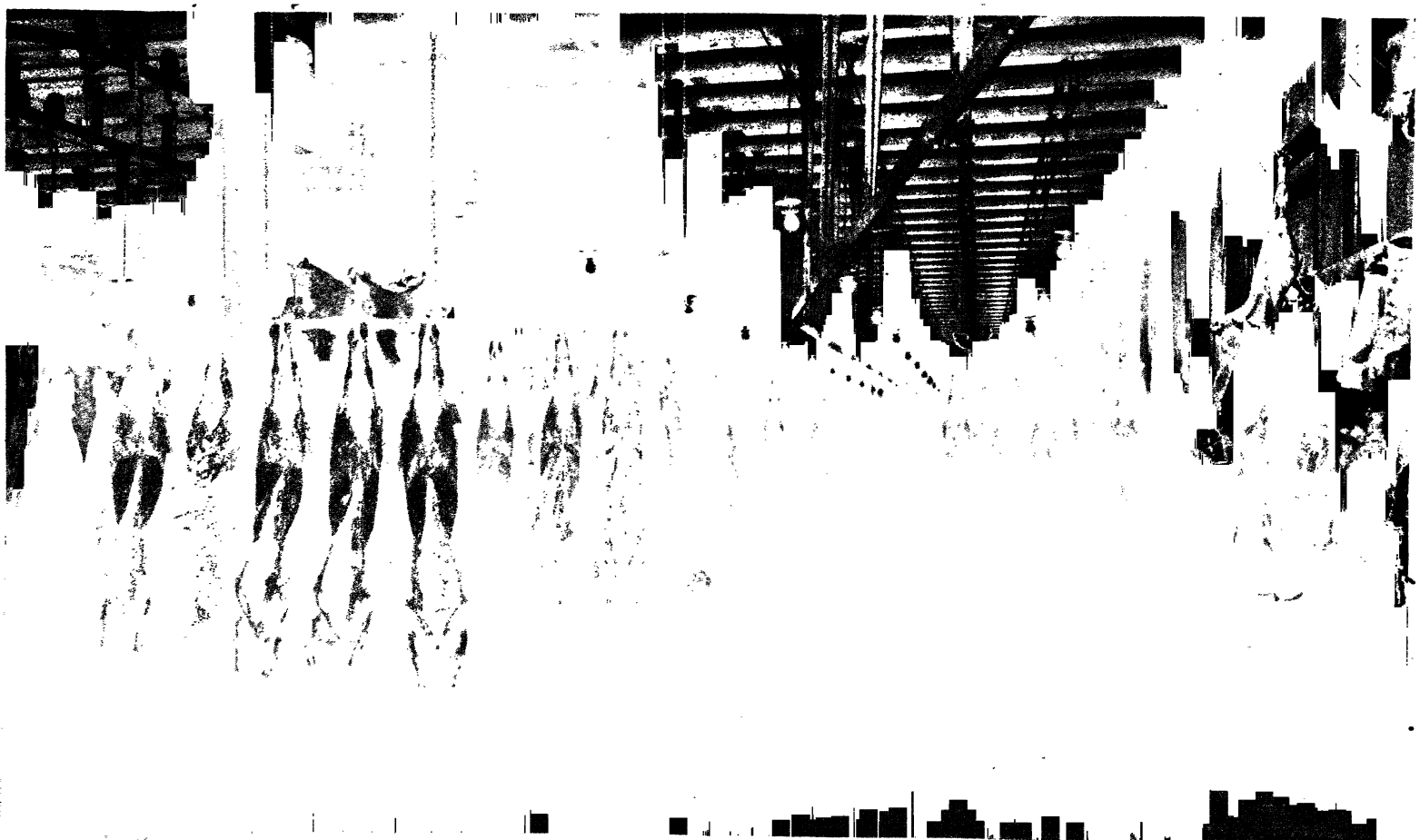
One might go on at length showing the wonderful possibilities of agriculture that lie in the future. Even if there should be no other developments than those which, by experience alone, we are able to forecast, there is no question but that the prospect of the world's starvation is to all practical purposes as remote as it was in the days of the pessimistic Malthus.

But just as the forecasts of Malthus failed to consider the possibilities of the age of agricultural machinery, the age



A TWENTIETH CENTURY SHEEPFOLD

Few other nations have as many domestic animals per capita as we have. There are 31 sheep for every hundred people in the world, 9 hogs, 25 cattle, and 6 horses. The United States has 50 sheep for every hundred people, 60 hogs, 58 cattle, and 24 horses.



Photograph from U. S. Department of Agriculture

SHEEP CARCASSES HANGING IN CHILLING ROOM, OR "COOLER"

"Cold storage is destined to play an increasingly important part in the handling of the world's food supply as the years go by and the demands for food increase. It is less than four decades since the first cargo of beef chilled by machinery instead of by ice was shipped, but today the funnels of refrigerator ships trace their lines of smoke upon every horizon" (see text, page 21).



Photograph by F. Lamson-Scribner

A FLOCK OF THOUSANDS OF SHEEP IN THE ARGENTINE REPUBLIC

The Argentine Republic is second only to Australia in the amount of mutton produced. It has 70 sheep to the square mile, where we have 17. It also exports more beef than any other country, having practically driven the United States out of the beef-exporting business. Where we exported 351,748,000 pounds of fresh meat in 1901, our exports in 1913 were only 7,362,000 pounds. On the other hand, Argentina's exports rose from 504,000 quarters in 1901 to 4,093,000 quarters in 1913.



Photograph by Frank H. Bothell

A FARMER LASSIE FEEDING HER COSSET

There are many little Marys and their lambs on American farms, and the lambs become as attached to their little mistresses as dogs do to their masters

of commercial fertilizer, and the age of preventive medicine as applied to live stock, so it is probable that the prophets who predict a hungry world in the not-distant future are failing to reckon with the possibilities of further extension and improvement of agricultural conditions.

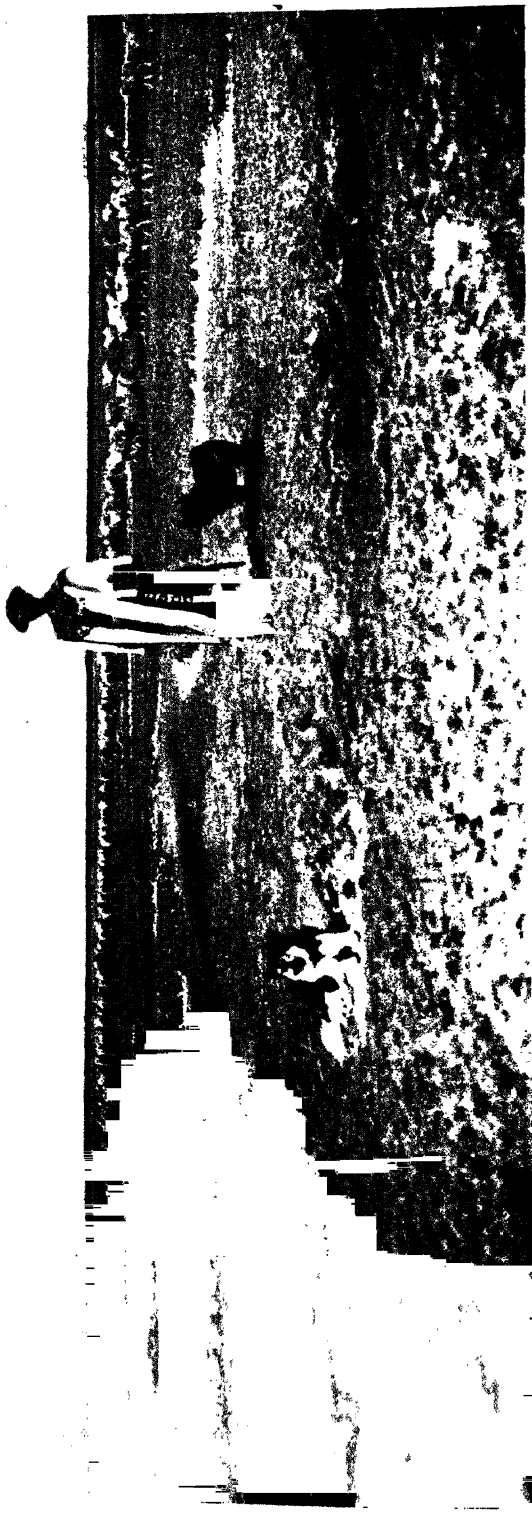
Furthermore, they also entirely neglect the fact that synthetic chemistry is delving deeper into the mysteries of nature's laboratories in the roots and stalks of the plant world, and is gradually coming to the point where it can take the raw materials that the plant itself takes from the soil, and make foods in factories perhaps as well as nature makes them on the farm.

CONTINENTAL CHARACTERISTICS

In any study of how the world is fed, one discovers very soon that the various continents are characterized by widely varied forms of diet. Australia, smallest of continents, is the largest meat eater of them all. Asia, the largest continent, is the smallest meat eater among them. Africa and South America lean toward vegetarianism, while North America and Europe are large consumers of meat and other animal products.

Although Asia has fifty-three out of every hundred of the world's inhabitants living within its boundaries, it has, outside of India, comparatively few cattle, only a negligible number of hogs, and not a great many sheep. Fish, rice, and vegetables form the principal articles in the Asiatic market basket.

The average meal of the laboring class of China consists mainly of rice, a little cabbage boiled in a lot of water, and



Photograph by A. W. Cutler

A SHEPHERD ON THE PLAINS OF HORTOBAGY: HUNGARY

a small piece of turnip, pickled in brine, as a relish. From our standpoint, the Asiatic is a greatly underfed being, and yet wherever men are employed tribute is paid to the physical endurance of the Chinese coolie (see page 5).

The food of the 180,000,000 people who live in Africa is almost as simple as that of the Asiatics. It is largely vegetable, although roasted elephant foot is still one of the favorite dishes of the jungle dinner. South Africa eats largely as Europe eats, while the make-up of the North African market basket is almost identical with that of southwestern Asia.

It is probable that less than one-third of the earth's population gets what an American would call three square meals a day. Adding to the native population of Asia and Africa the Indians and half-breeds of South America, the aborigines of the islands of the sea and of Australia, and to them adding the underfed population of eastern Europe, we find that approximately 1,250,000,000 of the earth's population sit down to a scanty menu.

THE WORLD'S MEAT

Taking the world's supply of cattle, hogs, and sheep, and making proper allowance for the less improved methods of stock-raising on other parts of the globe as compared with those of the United States, it appears that mankind at



Photograph by Miller Photo Co.

ELIGIBLE FOR MEMBERSHIP IN THE ROUGH-RIDER REGIMENT

Bull-riding in Oregon is less brutal than bull-fighting in Mexico, but it is better sport, and the cowboy who herds our future beef supply is nothing if not a lover of good sport

large uses in the neighborhood of 47,000,000,000 pounds of meat a year. This would be an average of about 39 pounds per capita throughout the world. The people of the United States a few years ago were eating 172 pounds per capita, which is more than four times as much as the average for the race (see pages 10 and 15).

Next to the Australians, the American people are the largest of all meat eaters. In butchers' meat, the latest statistics showed the American to be eating 172 pounds, the Englishman 119 pounds, the German 113 pounds, the Frenchman and the Belgian 80 pounds, the Austro-Hungarian 64 pounds, the Russian 50 pounds, and the Spaniard 49 pounds. The average American eats 80½ pounds of beef, 7½ pounds of veal, 78 pounds of pork and lard, and 6½ pounds of mutton and lamb a year.

Where we eat 80 pounds of beef, the Englishman eats 56 pounds, the Frenchman 37 pounds, and the German 36 pounds. Where we eat 78 pounds of pork, including lard, the Englishman eats 33 pounds, the German 67 pounds, and the Frenchman 26 pounds.

We eat 7½ pounds of veal where the Englishman eats 4 pounds, the German 7½ pounds, and the Frenchman 8 pounds; and we eat 6½ pounds of mutton and lamb where the Englishman eats 26 pounds, the German 2½ pounds, and the Frenchman 9 pounds.

From these figures it will be seen that the Frenchman eats less than half the beef we do. He eats as much beef as the German, but less than half as much pork.

MEAT SUPPLY OF CENTRAL EUROPE

It is interesting to study the per capita production of meats in the countries of the Central Powers at the present time. The statistics of the United States Department of Agriculture reveal the fact that Germany, Austria-Hungary, Bulgaria, and Turkey had a total of approximately 50,000,000 cattle before the war began.

The Department of Agriculture says that about one-fifth of the total number of cattle in Germany are slaughtered an-



THROWN BY A BUCKING BULL

Photograph by Miller Photo Co.

We do not, like Nebuchadnezzar of old, have to eat grass ourselves, but we do eat it by proxy. We make the cattle of the ranches manufacture it into flesh for our benefit. Incidents like the one shown in the picture are the cowboy's antidote for the loneliness of the bounding plain.



Photograph from Union Stock Yards Co., Chicago

TYPICAL SCENE IN THE UNION STOCK YARDS, CHICAGO

There are about 200 cattle in the first pen in the foreground and probably several thousand in the area of the picture. The Union Stock Yards receive an average of about 7,000 cattle, 17,000 sheep, and 24,100 hogs every working day. The receipts of cattle for 1914 were 2,601,000, of sheep 5,378,000, and of hogs 6,618,000.



Photograph by Curtis & Miller

HOGS GROWN ON ALFALFA UNDER IRRIGATION: WASHINGTON STATE

The United States and Europe raise more hogs than all of the remainder of the world together. This is because of all domestic animals the hog is the least widely accepted. More than half the world still regards hog meat as unfit for human consumption.



Photograph from U. S. Department of Agriculture

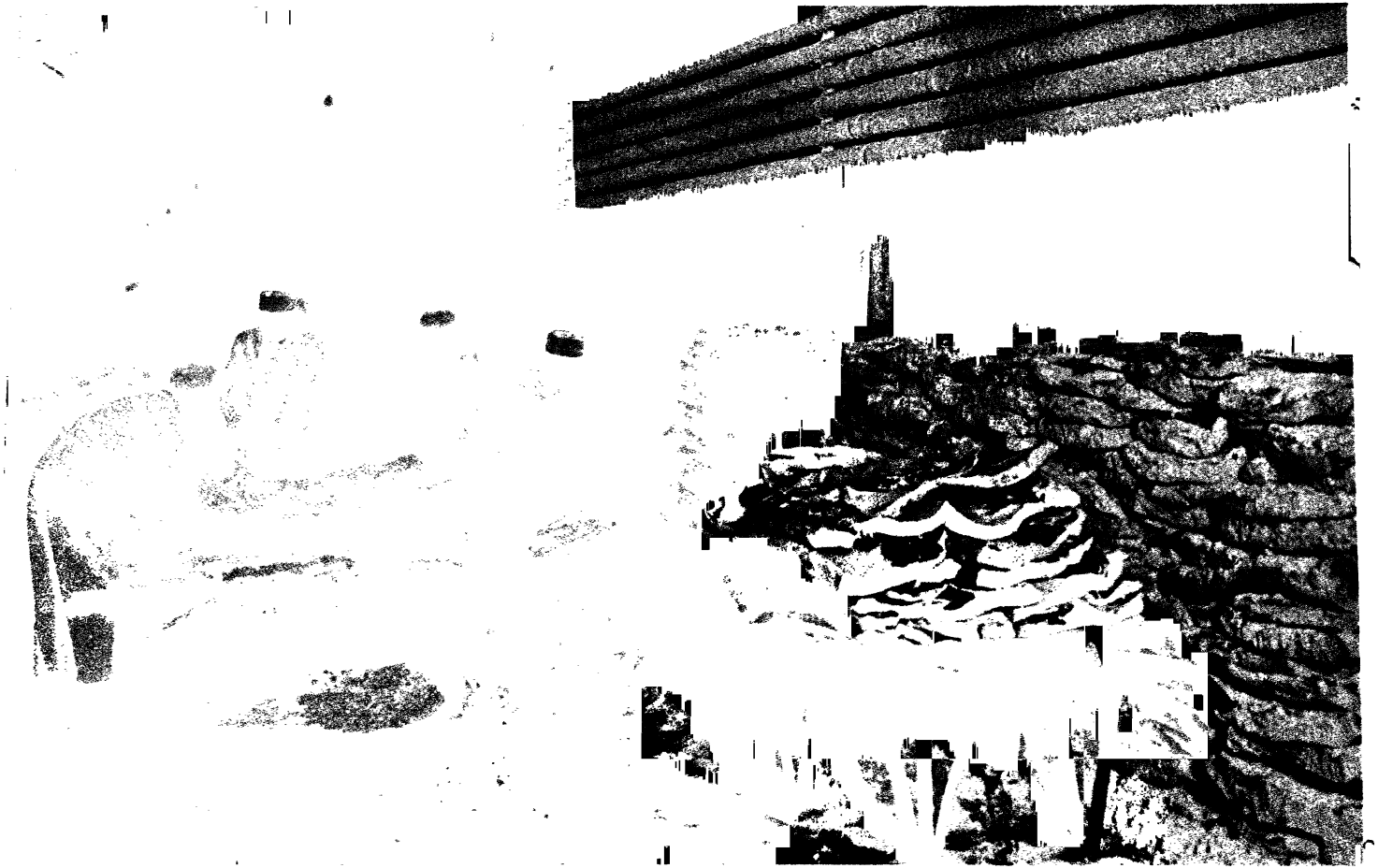
STUFFING SAUSAGE IN A MODERN PACKING-HOUSE

The operatives in the sausage department have their nails manicured and their hands sterilized every time they come into the packing rooms. The factory output of sausage in the United States is worth $60,000,000 annually.

nually. Assuming that the net weight of those of Germany and Austria-Hungary corresponds with the net weight of our own cattle, and that the net weight of those of Bulgaria and Turkey is only 300 pounds where ours is 543, it would appear that there is a 34 pound per capita production of beef in the Central Powers.

There are 37,000,000 hogs in the countries of the Teutonic Alliance. The Department of Agriculture's statistics show that the annual slaughter in Germany is 110.4 per cent of the total number of hogs on hand at a given time; therefore it would appear that there is a per capita production of pork amounting to 45 pounds in the Central Powers. Based on the German ratio of the sheep killed to those found on the farms of the country at a given time, the annual slaughter of sheep in the region controlled by the Central Powers is 31,000,000.

Assuming that the average dressed weight per sheep is only 30 pounds, as compared with 41 pounds in the United States, there would be a production of 941,000,000 pounds of mutton, or 6.7 pounds per capita. This gives a total



Photograph from U. S. Department of Agriculture

INSPECTING SALT MEAT IN A BIG PACKING-HOUSE

While salt meat represents only a comparatively small share of the meat production of the United States, yet, neglecting the farm slaughter and that of the retail butcher, we produce 9½ pounds of salt pork, 8 pounds of ham, 3½ pounds of shoulder, and 7½ pounds of side meat per capita.

production of meat, omitting horse and goat meat, of 85.7 pounds per capita among the Central Powers. The Department of Agriculture gives the average German consumption as 113 pounds, and the average Austria-Hungarian consumption as 64 pounds. It is probable that Bulgarian and Turkish consumption approximates that of the Russian, which is 50 pounds.

WE ARE EATING LESS MEAT

In the past few years the United States has shown a tendency to reduce the volume of meat it consumes per capita. The high cost of butchers' meats has forced Americans to find substitutes, and it is not improbable that in the course of another generation meat eating in this country will fall far below the mark it has hitherto held.

Not only has our home consumption of meat fallen off, but our exports of animal products have declined immensely in ten years. If it were not for our enormous exports of lard, we would be in danger of having our foreign meat trade become a negligible quantity.

But in spite of the slowing up of per capita home consumption and of our declining meat export trade, the meat-packing industry today still takes first rank among all the manufacturing industries of the United States in the value of its products. Under the 1910 census the products of the meat-packing industry were valued at $1,370,000,000, as compared with $1,228,000,000 for foundry and machine-shop products, their closest rival (see pages 18 and 20).

More than 100,000 people are engaged in the slaughtering and meat-packing industry. During a recent year the on-the-farm production of meats on the American farm was: 8,265,000,000 pounds of beef, 409,000,000 pounds of veal, 987,000,000 pounds of mutton and lamb, and 6,856,000,000 pounds of pork.

THE IMPORTANCE OF LARD

Lard is one of the principal items of animal products exported from the United States today. Our total production of this commodity annually amounts to approximately 1,500,000,000 pounds, of which more than 500,000,000 pounds go to other countries. Germany heretofore has taken the bulk of the lard we have exported, and the cutting off of this supply has been one of the hardships the Central Powers have had to face (see pages 21 and 22).

We use more than 10 pounds per capita in the United States, and it is generally believed that the German demand for this product is larger per capita than our own. If the 41,000,000 hogs slaughtered within the confines of the Central Powers annually produce as much lard per animal as ours, the per capita supply of the Central Powers will approximate a little less than 8 pounds.

While many substitutes for lard have been found, among them cotton-seed oil and olive oil, there is no prospect that the world will ever be able to do without a very large supply of this product of the hog. The necessity of some fat or oil in the human diet is borne witness to no less by the experts in dietetics than by the universality of the use of fats and oils in cooking throughout the world.

One cannot go far enough afield—even in the remotest corners of the earth—to get beyond the reign of vegetable oils and animal fats in the human dietary. Fats are the greatest of all of the heat and energy producers with which nature provides mankind. The man fed on a diet from which all fats and oils are excluded very soon has serious disturbances of his digestive processes.

THE EVOLUTION OF THE PACKING-HOUSE

The meat-packing business is the development of the present generation. Where once there were slaughter-houses in every community, and the business of slaughtering live stock for food was widely scattered, today the industry is narrowly concentrated, and a half dozen packing towns do perhaps three-fourths of all of the butchering business of the country.

When Gustavus Swift first conceived the idea of doing the butchering near the centers of animal production and shipping the dressed meat to the centers of consumption, he saved to the American consumer one of the heaviest freight bills



Photograph from U. S. Department of Agriculture

INSPECTING VISCERA OF CATTLE CARCASSES

the nation was paying. Not only did he save the difference between the live weight of the stock slaughtered and the dressed weight, but he was able to put more tons of dressed beef into a car than he could of cattle.

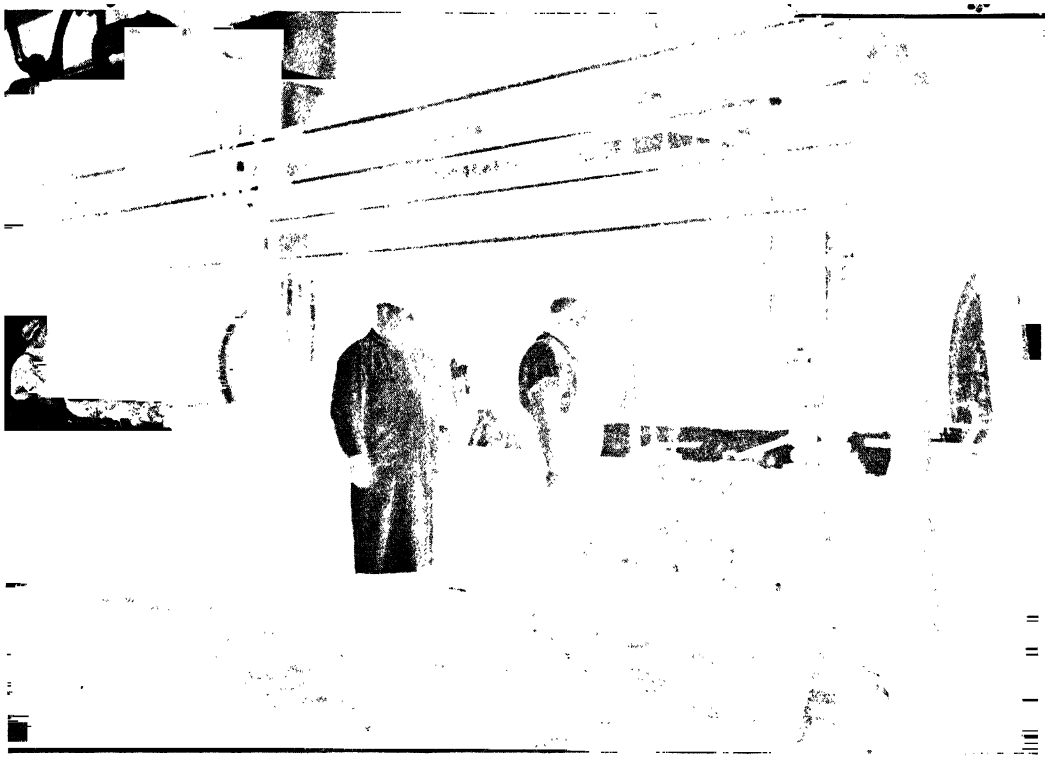
The packing business was first built up on the saving in freight. Later the use of the ordinary wastages of the slaughtering business in the manufacture of by-products effected other savings as remarkable as those on freight.

PRICE DISPARITIES

The question of the disproportion between the prices of cattle on the hoof and those of roasts and steaks is by no means a new one. Away back in 1858 people were asking how it happened that roasts and steaks were selling at 15½ cents when cattle on the hoof were bringing less than 7 cents.

It seems strange in these days to think of buying best rib roasts and porterhouse steaks at 15½ cents a pound, and yet in that year the American Agriculturist took a heavy steer through the market from the slaughter-house to the retail customer, tracing the profits derived therefrom, and found that it could be done and still leave a profit of more than five dollars per carcass to the butcher.

In those days, before the packing-town idea was evolved, there was a margin of nearly 5 cents between the price of beef on the hoof and the dressed carcass;



Photograph from U. S. Department of Agriculture

RENDERING LARD IN A CHICAGO PACKING-HOUSE

Ask your cook what dishes she would be able to prepare for you if she had no lard, butter, nor oil

under the economies that have been effected through the packing-house idea the margin is approximately only half as much. What the prices for our steaks and roasts would be if the margin of price between meat on the hoof and meat in cold storage were as great as it used to be, one can only surmise!

THE RISE OF REFRIGERATION

How one step in the progress of catering to the world's food demands makes another possible is nowhere better shown than in the case of the packing industry. When that humble citizen of Florida, John Gorrie, invented the ice-making machine, he not only enabled the whole world to know the delights of a plentiful supply of cold water, but he also made it possible to exchange its perishable products, so that the tropics might give to the temperate zone their fruits, and the temperate zone might send to the tropics their excellent corn-fed meats and other cold-storage foods.

Once there were entire nations where only the favored few ever knew the refreshing experience of a cold drink, and it always happened that these nations were situated in those regions where a cold drink means most to humanity. The ice factory, which has meant so much to us in its relation to our own food supply, has brought the delights of ice-cream and soda water to those hundreds of millions of people who live between Capricorn and Cancer, the while it has given them Chicago, Omaha, Kansas City, and St. Joseph meats.

Cold storage is destined to play an increasingly important part in the handling of the world's food supply as the years go by and the demands for food increase. It is less than four decades since the first cargo of beef chilled by machinery instead of by ice was shipped, but today the funnels of refrigerator ships trace their lines of smoke upon every horizon.

Any one who has lived on a farm and has seen the amount of wastage there is



Photograph from U. S. Department of Agriculture

FILLING TUBS WITH PURE LARD

There are a number of grades of lard. Leaf lard is made of the fat surrounding the intestines and kidneys. Other grades are made from other fats, being reduced to a liquid grease by steam heat and then drawn off into tubs, as shown in the picture.

in the vegetable garden and the truck patch by reason of a lack of facilities for taking care of the surplus, will readily understand what a saving there could be if a cold-storage plant were convenient. Gradually these plants are coming closer and closer to the farmer, many of whom already are making use of them to store their perishable products, like fruits, vegetables, and eggs, until the higher prices of the winter months set in.

THE FISH SUPPLY

As the world fills up with people, the more humanity is bound to look to the sea for food, and a rich field will there be found. Already the United States has a fisheries industry the value of whose product nearly offsets the value of the product of its wonderful apple orchards. Our fisheries yield a return of $70,000,000 a year, which almost exactly duplicates the returns the United Kingdom receives from her fishing industry. France's annual catch reaches a value of $33,000,000, while that of Russia amounts to $50,000,000. Austria-Hungary and Germany together have a total catch of only $12,000,000 value (see pages 26-27).

It has been conservatively estimated that the world's fish supply exceeds twenty billion pounds. Japan's fisheries produce about six billion pounds a year. What our western grazing lands have been to our meat supply, that has the sea been to Japan's.

A census of the sea would reveal more animal life to the square mile, perhaps, than the land itself possesses. There are all sorts and shapes and varieties of aquatic life to be found, and the rich treasures of food which the rivers of the earth carry down to the oceans defy measure.

Gradually new fishing grounds are being opened up and new varieties of fish introduced to the public. Just now the efforts of the United States Bureau of Fisheries to restore the tile-fish to the American dinner table, and its plans for a campaign of education in favor of the edibility of the dogfish, are straws which show the direction of the wind in the utilization of the vast food treasures of the sea.

CHINESE GREAT FISH EATERS

The Chinese are among the greatest fish eaters of the world, and they have accepted so many varieties in their list of edible fishes that they can have a different kind for breakfast every morning in the year. Not only are their seas filled with fish, but their rivers as well, and while no other nation has gone as far as the United States in scientific fish propagation in fresh waters, the Chinese have cared for their fish supply through a hundred generations.

All sorts of methods for catching fish have been developed by the nations of the earth. It is a far cry from the big steam trawler of the North Sea to the hook and line of the small boy on a country creek bank. But most picturesque of all the ways of fishing in the world is that resorted to by the Chinese—fishing with cormorants. The cormorants are hatched under chicken hens, and when about three months old are taught to fish.

The trainer ties a string to one of the bird's legs and drives it into the water. He then throws out some small fish which the bird promptly catches. It is taught to dive and come back at the call of a whistle. When trained, collars are put about the bird's neck, so that it cannot swallow the fish it catches. A fisherman goes out with the rail of his boat lined with string-hitched cormorants. At a given signal they dive, and the fish that can outswim them under water is as rare as a small fish in an angler's description of his catch.

THE CEREAL CROPS

That the vegetable kingdom has more to offer the world's market basket than the animal world is revealed by a comparison of the animal products and the vegetable products of the food factories of the United States—the greatest animal-food producing country on the globe.

Although a smaller portion of the vegetable products of the country passed through factory processes than of the meat products, the vegetable manufacturing processes employed, at the last census, 292,000 people and turned out a product valued at $2,237,000,000, while

the animal product factories employed 119,000 people and yielded an output valued at $1,700,000,000.

The total products of the farms of the United States that year amounted to more than all the gold mines of the world have yielded in six centuries (see page 32).

BUMPER CROPS AND PRICES

The world's normal yield of the six great cereal crops—oats, wheat, corn, rye, barley, and rice—ranges between sixteen billion and nineteen billion bushels, and statistics show that the farmer gets less ordinarily for his big crop than he receives for his small one.

Excluding rice, we find that the 1911 cereal crop amounted to 13,786,000,000 bushels. The average value per bushel, based on the average farm price for the United States on December 1, was 72.9 cents, giving a total crop value of $10,030,000,000. The crop of 1912 was the bumper crop of the world's history, reaching a total of 16,115,000,000 bushels. The average farm price on December 1, 1912, in the United States, was 54.7 cents per bushel, showing a world crop value of $9,814,000,000.

In other words, the farmers of the world handled 2,329,000,000 bushels more of grain in 1912 than in 1911, and yet they got $1,216,000,000 less for the big crop than for the small one.

The same condition is shown in a comparison of the statistics for 1906 and 1907. Although the world's farmers produced three-quarters of a billion bushels of grain less in the latter year than in the former, they received nearly two billion dollars less for the large crop of 1906 than for the small one of 1907.

THE WORLD'S WHEAT CROP

Though man shall not live by bread alone, western civilization would find it very difficult to get along without wheat and its products. Although the wheat plant is not of western origin, it has become mainly a western product, marching hand in hand with western civilization. The world's total production of wheat approximates 4,000,000,000 bushels a year. It would take 4,000,000 of the largest freight cars, making a train reaching more than one and one-half times around the earth, to move this great annual yield. Moving at twenty miles an hour, this train would take thirty-odd days to pass a given point.

The wheat crop of the United States is approximately one-fifth of that of the entire world. It would seem that, with the development of the northwestern part of this country, wheat had at last reached its limit of cultivation on American soil; but those who have studied the question most closely tell us that the wheat-growing industry has heretofore simply followed the lines of least resistance, picking out here and there the lands best suited for wheat growing; and that since all the choicest land has been opened up, the wheat growers will gradually drift back and take up the less available lands that they passed over in looking for the best (see page 34).

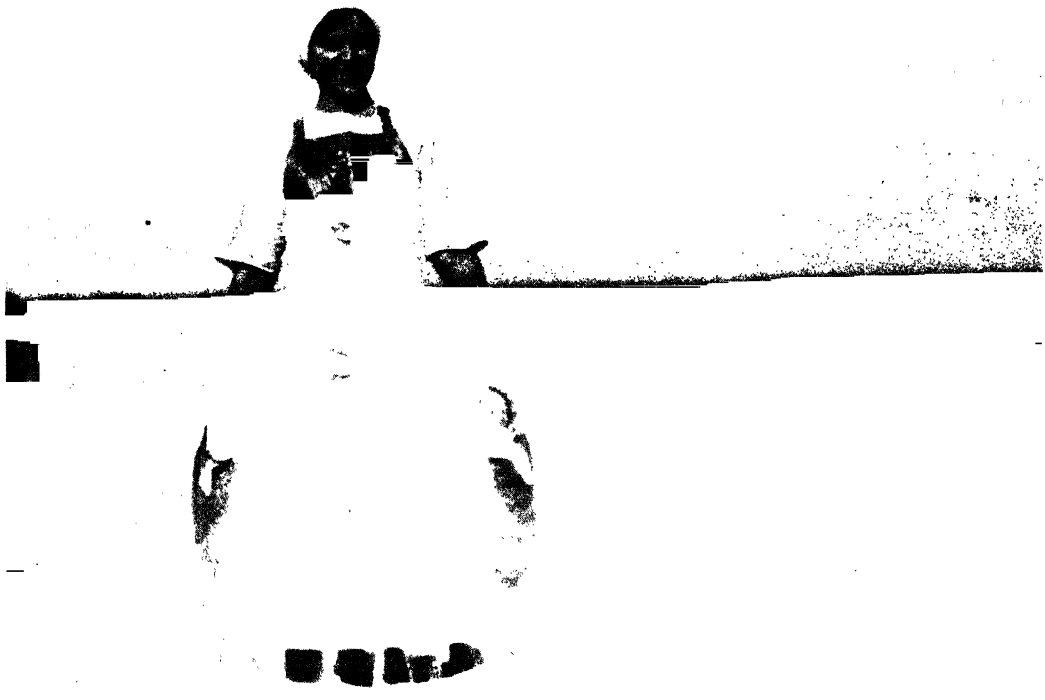
Not only will the trend of the wheat field be east and south, but it is certain to reach farther and farther into what is now the semi-arid regions of the West. Between its extension into the desert through irrigation and its advance into the semi-desert through the introduction of hardy, drought-resisting varieties, America is afar off from the time when the potential acreage and yield of her wheat fields is reached.

It is estimated that it will be easily possible for the United States to double its wheat-growing area. That would give us an average which, when we approximate western European standards in wheat growing, will yield very nearly as much wheat as the whole world produces today.

It has been strikingly said that he who can add a grain of wheat to each head of the world's wheat fields can give bread to millions of people, and when the United States extends her acreage to its maximum and develops the yield to its limit, nations yet unborn can rise up and secure bread from her flour bins.

RUSSIA'S WHEAT FIELDS

But as full of possibilities as the wheat-growing industry of the United States may be, they are few in comparison with



Photograph by Curtis & Miller

A FAIR "FISHERMAN": WASHINGTON STATE

"As the world fills up with people, the more it is bound to look to the sea for food, and a rich field will there be found" (see text, page 23)

those of Russia. That wonderful country, possessing more latent agricultural resources, perhaps, than any like area in the world, has 288,000,000 acres of excellent wheat land. Even at our present standard of production, which is less than half of that of western Europe, Russia alone could produce more wheat than is raised on the entire globe today.

As matters now stand, the Russian crop is only about ten bushels per acre. That her lands are as fertile and her climate as well suited to the growing of wheat as those of England and Germany are facts well known to all those who have considered her relations to the world's future food problems. Even today, in spite of her small per-acre production of every principal crop, Russia is the greatest exporter of grain in the world.

We ordinarily think of the exportation and importation of food products as being one of the most important considerations in relation to production. The world's prices for these commodities are



FROZEN HALIBUT: WASHINGTON STATE

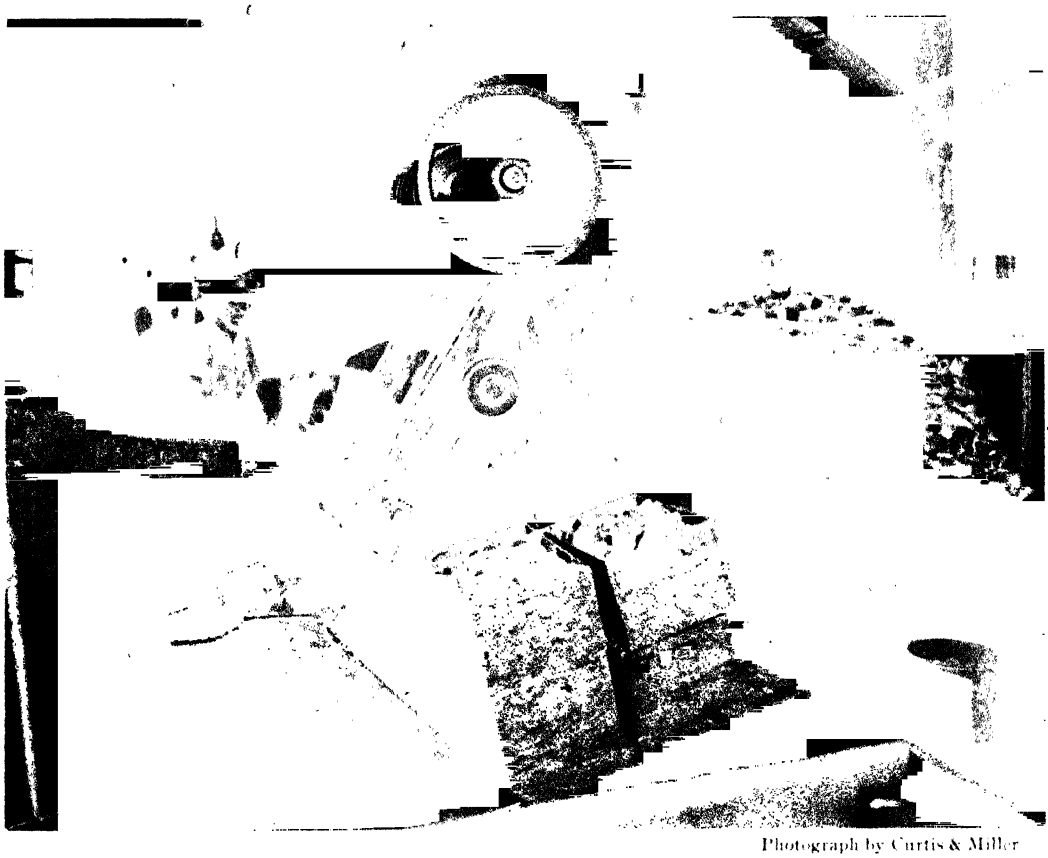
Photograph by Curtis & Miller

Japan is showing the world how it is possible to get along with a very small butchers' meat supply. Its annual fish catch is rated at six billion pounds, which represents a greater weight than the dressed weight of all our beef, veal, mutton, and lamb. The Japanese virtually have come to look to the sea for their meat supply.



A WAREHOUSE FULL OF SALMON READY TO CAN

Photograph by Curtis & Miller



Photograph by Curtis & Miller

CUTTING SALMON FOR THE CANS

The salmon are fed into the "iron chink," which automatically removes the head, fins, and viscera; after that it goes to the cutting machine, which prepares it for the can

fixed by the prices received for that portion of the product moving in international trade. And yet it is quite a good bit a case of the tail wagging the dog, as will be seen from the figures in relation to wheat. Out of 4,000,000,000 bushels of wheat raised in the world, only 600,000,000 get out into the channels of international trade.

THE ORIGIN OF WHEAT

The growing of wheat has so long been a principal occupation with man that its geographical origin is unknown. The Egyptians claim it originated with Isis, while the Chinese claim to have received the seed direct as a gift from heaven. The belief that it originated in the valleys of the Euphrates and the Tigris is more generally accepted than any other. The most ancient languages mention wheat, and it has been found by the archeologists in the kitchens of the prehistoric inhabitants of the Swiss Lake region. It is generally agreed that, at the lowest estimate, wheat has been a faithful servant of mankind for six thousand years.

A glance at the statistics of bread consumption shows that as meat consumption goes down that of bread rises up. The people of the United States consume 295 pounds per capita of wheat and rye per year, those of England 356 pounds, those of Germany 525 pounds, and those of France 550 pounds, which is in every case in inverse ratio to their consumption of meat.

According to available statistics, the Central Powers of Europe produced 501,000,000 bushels of wheat in 1913. This would give them a per capita production of 215 pounds. Their total production of rye amounted in the same year to 654,000,000 bushels, or 261 pounds per capita.



Photograph by Curtis & Miller

FILLING CANS BY MACHINERY

Twenty million cases of canned salmon are filled annually in Alaska

It will be seen from this that the per capita production of wheat and rye in the Central Powers is about 467 pounds, while Germany's consumption is placed at 525 pounds in normal times. It is probable that the per capita consumption is even greater in Austria-Hungary, Bulgaria, and Turkey than in Germany.

CORN AS HUMAN FOOD

While a thorough appreciation of hoecake and corn-pone is largely limited to our own Dixie, and while corn is mainly a stock food, still it occupies no inconspicuous place in the world's market basket, as any one who takes the time to examine consumption figures will find. The grist mills of the United States in 1909 produced 27,000,000 bushels of cornmeal and corn flour, and 837,000,000 pounds of hominy and grits, while the canning factories canned 168,000,000 cans of corn.

It is said that Mexico's production of corn is worth more, in normal times, than her production of gold, and although the Mexican mines are world famous for the prodigality of their yield, any one who has seen at first-hand the universal sway of the tortilla can well believe that the Mexican cornfield outranks the Mexican gold mine.

Today the United States produces two-thirds of the world's supply of corn. It devotes a little more than twice as much acreage to that crop as it does to wheat. Our average yield is 23.1 bushels to the acre (see page 32).

There is no place better suited to demonstrate the possibilities of scientific agriculture than in the handling of the nation's corn crop. If we were to take the average yields of all the boys' corn-growing clubs of the United States, we would probably find them ranging around eighty bushels to the acre. This would give a total yield, on the basis of the present



Photograph from U. S. Department of Agriculture

BEEF BALED LIKE HAY OR COTTON

All edible scrap meat in the packing-house is baled together and packed away in a freezing room to await conversion into potted beef and other similar products. Note the ice on the pipes.

acreage under cultivation in the United States, two and one-third times as large as that of the entire world today (see pages 101 and 105).

It is certainly not unreasonable to believe that the average farmer of the United States in future years will do as well as the average boy of the corn club today. When we remember that the youthful enthusiasts of the corn clubs of today will be the farmers of tomorrow, it probably is not too much to hope that the time is less than a generation distant when the United States can add billions of bushels of corn to the needs of a growing race.

It is fitting that the Americas should produce approximately three-fourths of the world's corn, for corn is a true American. It was here when Columbus came to the New World, and the early colonists left a record of the fact that they learned the lesson of its use from the red men.

BARLEY AND RYE

We who have spent all of our lives in the United States have little realization of the important part barley and rye play in the market baskets of many countries, for beyond a little barley broth and an occasional loaf of rye bread, the American does not often meet these cereals at meal time. Yet in Russia, in southeastern Europe, and in parts of Asia barley and rye meal are the raw material of the

bread of the masses. The barley and rye crops of the earth together would fill more than two million freight cars, enough to more than belt the earth at the Equator.

In Japan, when the people get too poor to eat rice they resort to barley, and it is said that there is a social distinction drawn between the rice-eating and the barley-eating natives. Barley formerly was more frequently used in western Europe than it is today; it was the cereal from which the goose pie was made in the early days of England.

In bulk, oats is the greatest of all the cereal crops of the world, though in weight it is surpassed by several others. It was Doctor Johnson, I believe, who said that they fed oats to horses in England and to men in Scotland. The retort was that Scotland was famous for its men and England for its horses. Though oats figure mainly in the world's diet as a breakfast food, still the total used as human food is an important one.



Photograph by A. W. Cutler

"TWO'S COMPANY": INCIDENTALLY A WHEAT-FIELD COURTSHIP

ASIA THE HOME OF RICE

Although the United States produces more than 700,000,000 pounds of rice, this is but a drop in the bucket as compared with the production of Asia. That continent, although making a remarkably poor showing in its production of live stock and those cereals which we most extensively grow, has almost a monopoly of the production of rice. Out of the total world's production of 162,000,000,000 pounds, it grows 159,000,000,000. Perhaps nine-tenths of all the rice eaten in the world is eaten by the Asiatics. To the great masses of Asia's unnumbered millions it is largely both bread and meat (see page 38).

The rice crop must be grown in water, the fields being kept flooded the greater part of the time until it matures. This necessitates a system of canals or other means of irrigation. In many parts of China and Japan the coolie laborers are always kept busy pumping water for the rice fields. In some cases they raise the water by hand from one level to another by buckets; in others, primitive water-wheels are equipped with treading-boards, so that the men can turn the wheels with their feet; still other wheels are turned by animal power (see page 39).

In the Philippines, Java, and parts of southern Asia thousands of water buffaloes are used to drag the plows and harrows through the mud in preparing the seed bed for the crop. In the chief rice-raising countries the harvest time is an important event. At the beginning the natives often have picnics; in Java, they erect little temples, about the size of a pigeon-house, containing an offering of



A TWENTIETH CENTURY CORNFIELD

Photograph from U. S. Department of Agriculture

"There is no place better suited to demonstrate the possibilities of scientific agriculture than in the handling of the nation's corn crop. If we were to take the average yield of all the boys' corn-growing clubs of the United States, we would probably find it ranging around eighty bushels to the acre. This would give a total yield, on the basis of the present acreage under cultivation in the United States, two and one-third times as large as that of the entire world today" (see text, page 29).



Photograph from A. W. Thompson

CORN RAISED BY A FARMER OF PRESTON, MINNESOTA

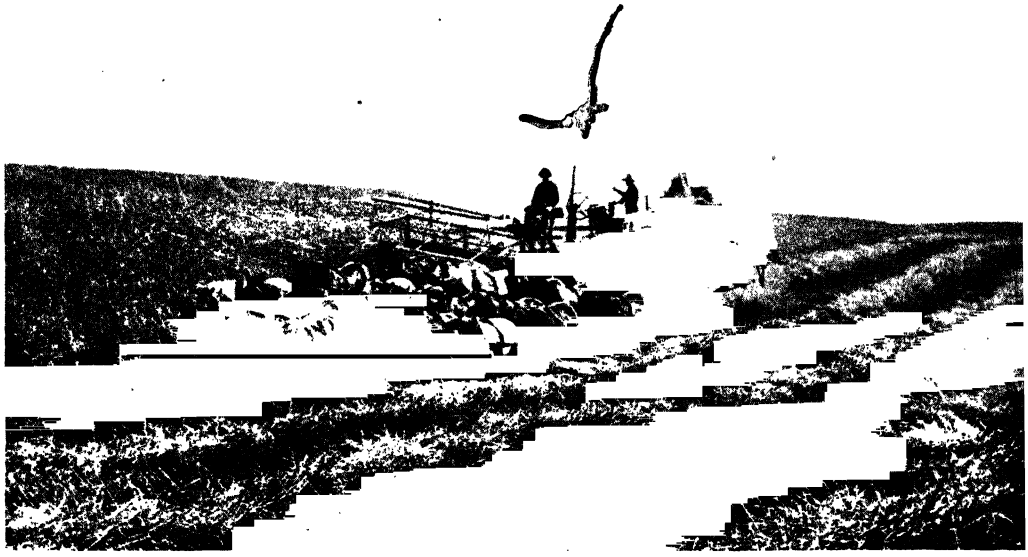
With such agriculture as this the United States and Russia alone could feed the whole world as it is populated today



A WHEAT FIELD IN EASTERN WASHINGTON

Photograph by Webster & Stevens

"It has been strikingly said that he who can add a grain of wheat to each head in the world's wheat fields can give bread to millions of people, and when the United States extends her acreage to its maximum and develops the yield to the limit, nations yet unborn can rise up and secure bread from her flour bins" (see text, page 24).



Photograph and copyright by Keystone View Co.

BONANZA FARMING IN THE NORTHWEST

This machine cuts, threshes, bags, and weighs the wheat in a single operation. The teamster who can handle the fifteen to thirty horses required to operate it commands good wages.

an egg, some fruit, a bit of sugar-cane, and some cooked rice.

The husks of rice stick so tightly to the grain that the latter is left rough when the husk is removed. The grains are thrown upon rollers covered with sheepskin and polished just as we might polish silver or gold. Medical science has learned that the absence of the elements contained in the rice husk produces the disease known as beriberi when an exclusive rice diet is eaten, just as a too exclusive diet of corn produces pellagra.

These two discoveries open up an entirely new field in the investigation of the causation of little understood diseases. They rank with the discovery of the method of transmitting malaria, yellow fever, bubonic plague, and sleeping sickness by mosquitoes, fleas, and tsetse flies, respectively.

THE PLACE OF THE POTATO

It has been the honor of America to contribute to the world its greatest crop in point of yield — the white potato. Making its bow to civilization from the land of the Incas, in Peru, the potato has girdled the globe, winning the esteem of every land and every people.

No other plant in the entire range of the vegetable kingdom has ever gone so far or met with such universal favor in so short a time as this apple of the earth. Today North America produces more than half a billion bushels, while Europe produces approximately ten times as much as our own continent, and has practically a monopoly of the potato-growing industry, producing nine out of every ten bushels grown in the world (see p. 106).

A NEW BEAST OF BURDEN

Figuring to such a large extent in the diet of the race, the potato offers a solution of one of the important problems that the farmers of the earth are facing. There are more than one hundred million horses in the world, most of them being found on the farm. To provide these horses with grain and hay and pasturage requires several hundred million acres of the world's best land.

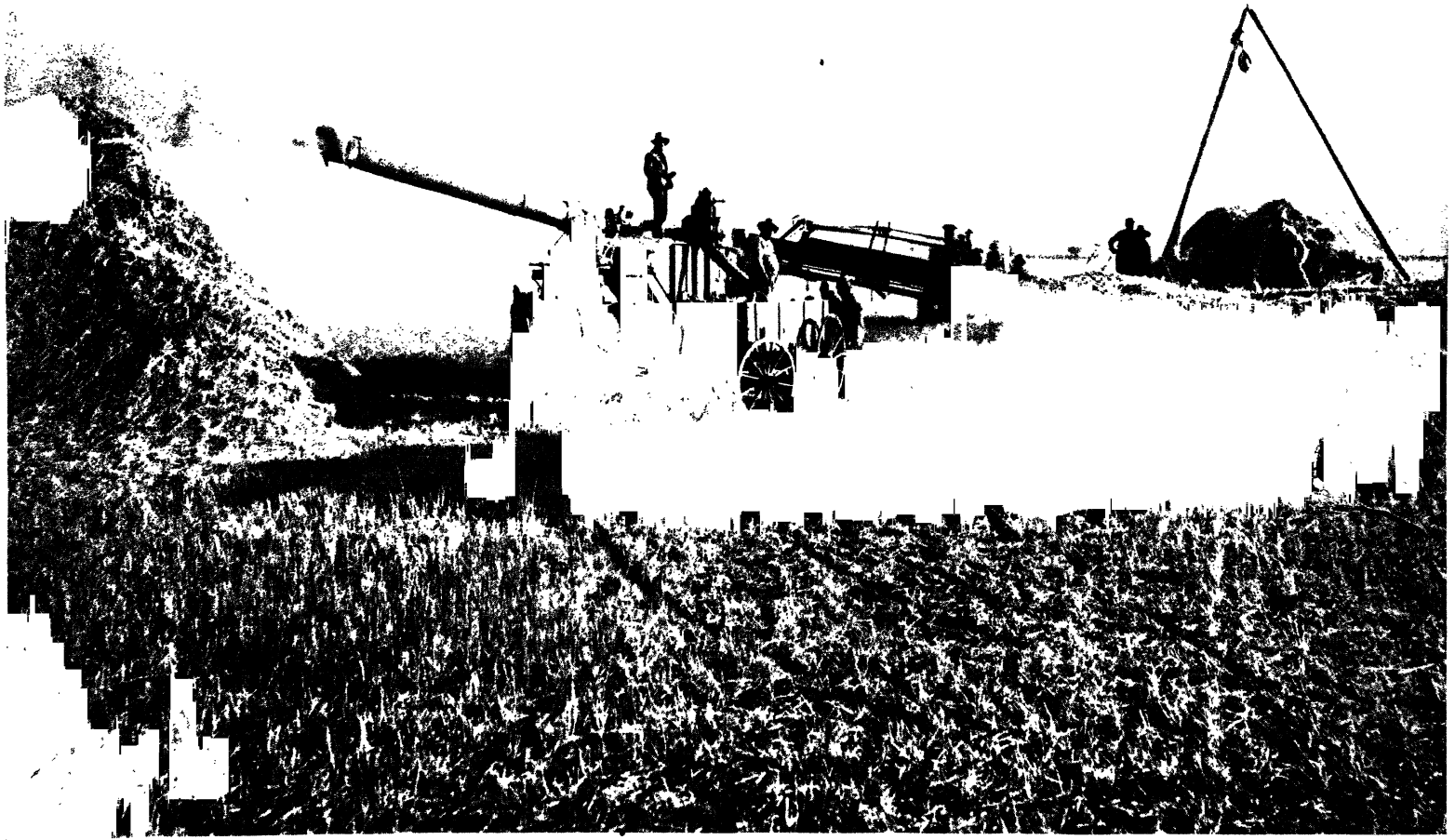
It so happens that the potato is an admirable material out of which to make alcohol for motive power. Under modern methods of distillation, a few acres of potatoes can be made to yield enough alcohol to drive the farm-tractors of an ordinary farm. The average farmer has held to the horse as a means of transportation because he could use him without



Photograph by Alfred H. Heinicke

WINNOWING WHEAT IN PERSIA

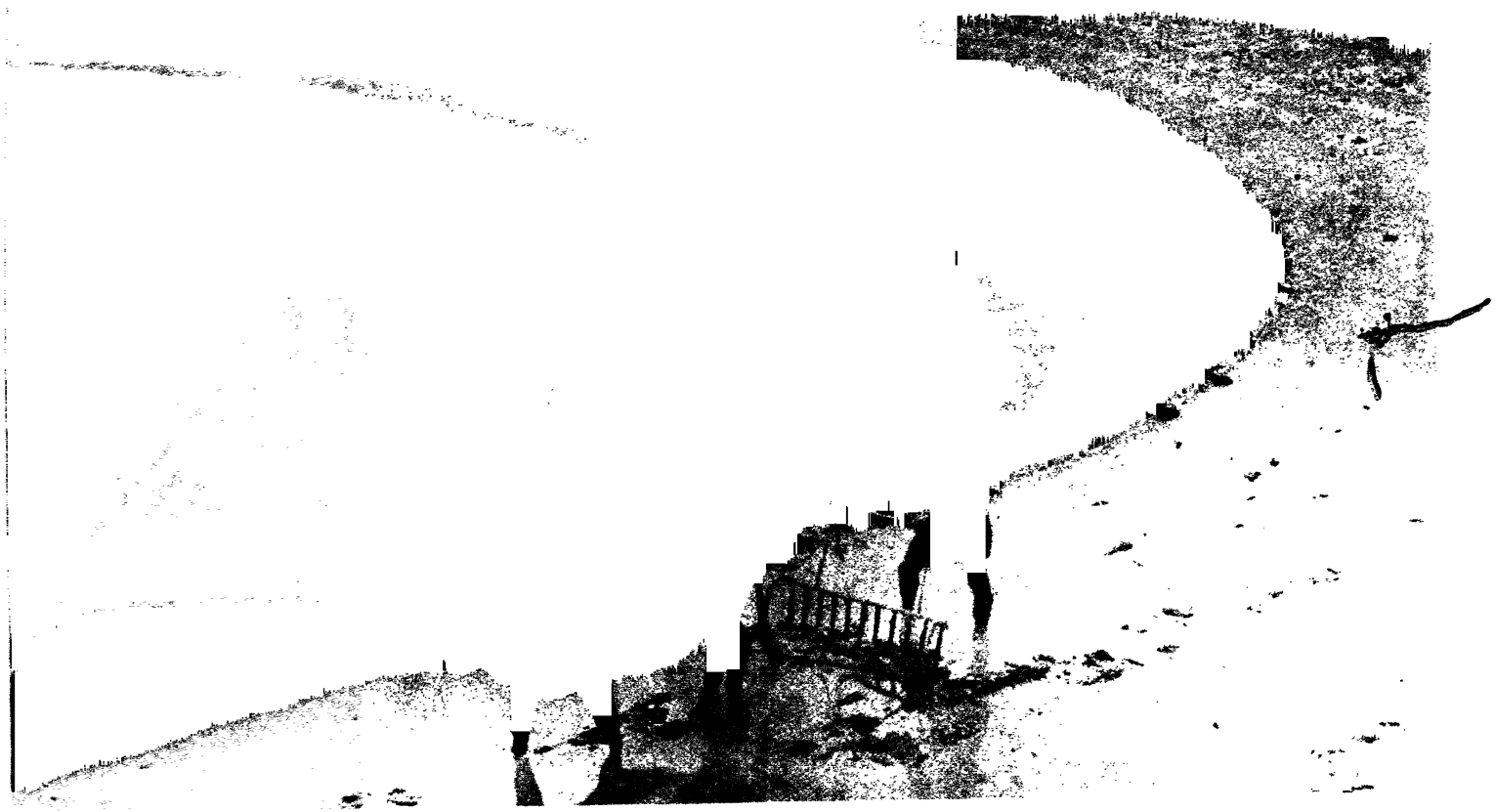
A comparison of this picture with those on pages 35 and 37 shows how man has multiplied his productive capacity many times since the advent of farming with machinery



Photograph from U. S. Department of Agriculture

THRESHING TIME IN THE WHEAT BELT

"That wonderful country (Russia), possessing more latent agricultural resources, perhaps, than any like area in the world, has 288,000,000 acres of excellent wheat land. Even at our standard of production, which is less than half of that of western Europe, Russia alone could produce more wheat than is raised on the entire globe today. As matters now stand, the Russian crop is about ten bushels per acre" (see text, page 25).



CULTIVATING RICE IN ASIA

urn loose (ir fancy as we dine, we could see a great army of men and women working that we might eat. The · upon all the continents and all the seas, and, where once all roads led to Rome, now they come directly to



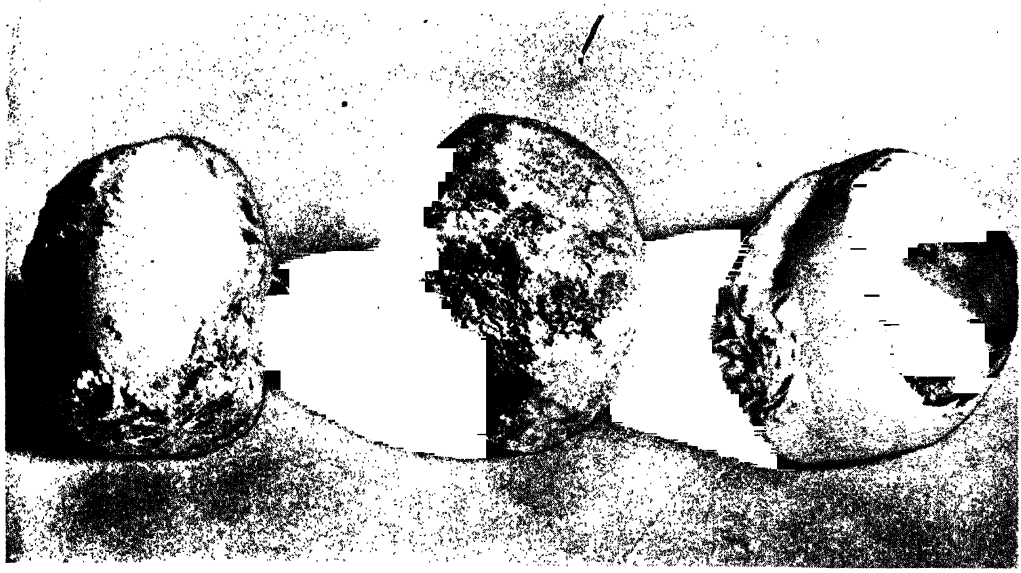
SOWING RICE BROADCAST: SIAM

Medical science has learned that the absence of the elements contained in the rice husks produces the disease known as beriberi when an exclusive polished rice diet is eaten, just as a too exclusive diet of corn produces pellagra



TRANSPLANTING RICE IN AN INUNDATED SOIL: JAPAN

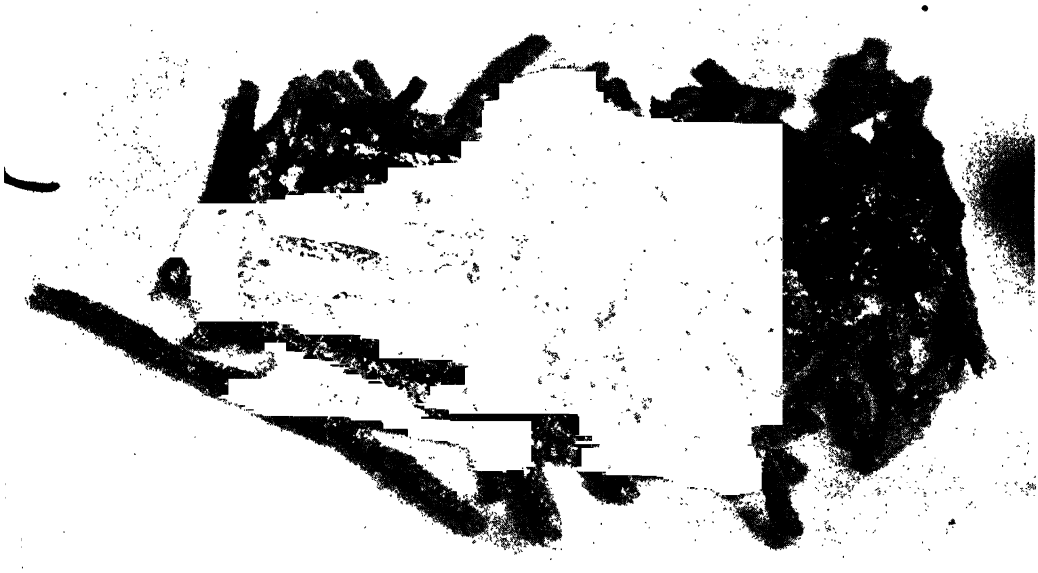
Rice yields best in lowlands subject to occasional inundations. In some districts it is sown broadcast (see page 30) and in some districts is transplanted after two or three weeks. The best rice soil is often not well suited for any other crop. Asia produces 90 out of every 100 pounds of the world's rice.



Photograph and copyright by the International Press Photo Co.

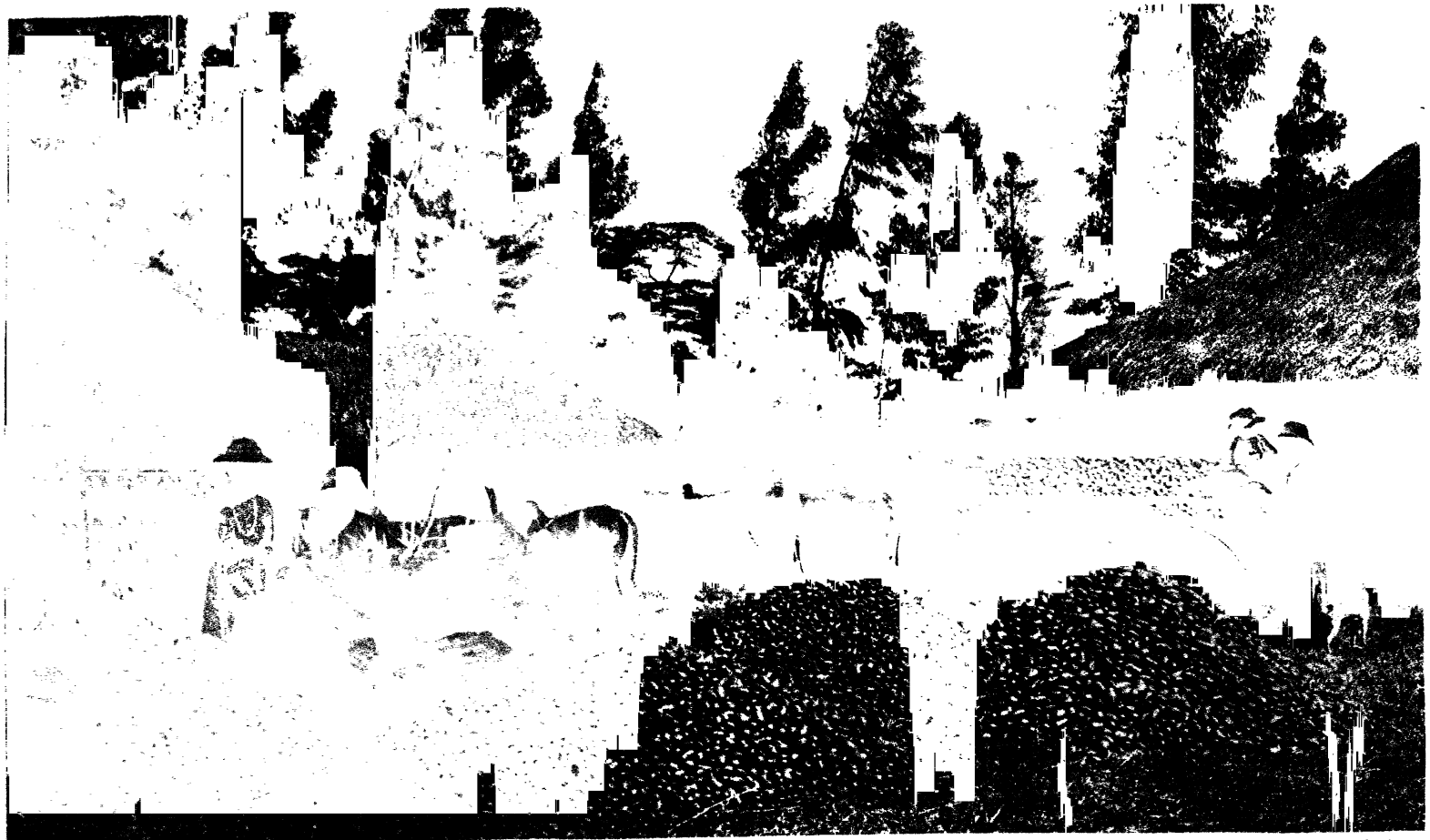
CHINESE EGGS WELL RIPENED

The ancient egg in China has as much standing in good society as wine of rare old vintage in Europe, there being no accounting for taste



Photograph and copyright by the International Press Photo Co.

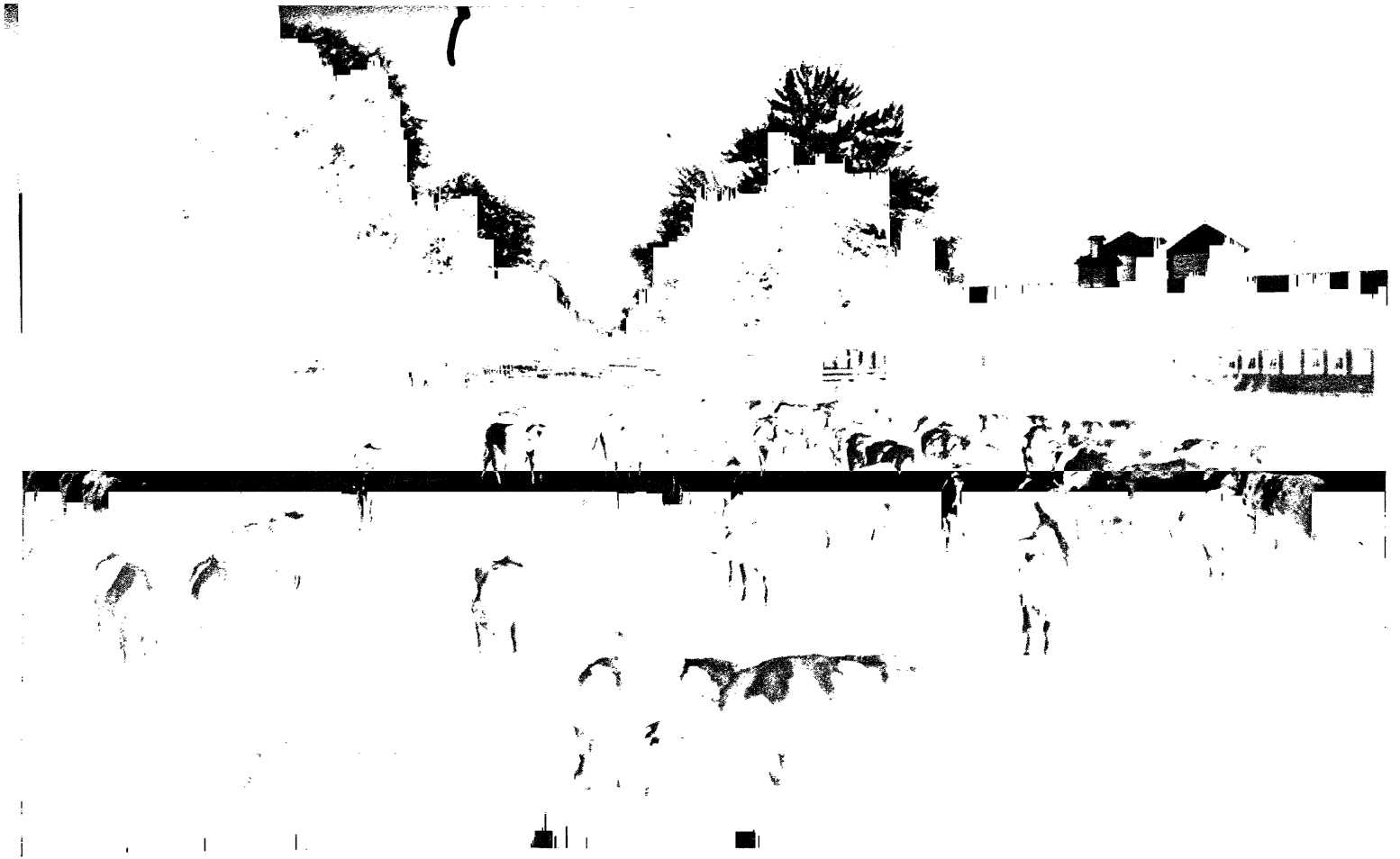
CHINESE EDIBLE BIRDS' NESTS ARE WORTH THIRTY DOLLARS A POUND



Photograph from F. J. Koch

BRINGING IN THE POTATO CROP: NEAR NAIROBI, EAST AFRICA

"It has been the honor of America to contribute to the world the greatest crop in point of yield—the white potato. Making its bow to civilization from the land of the Incas, in Peru, the potato has girdled the globe, winning the esteem of every land and every people. No other plant in the entire range of the vegetable kingdom has ever gone so far or met with such favor in so short a time as this apple of the earth"



Photograph by Curtis & Miller

HOLSTEIN-FRIESIANS ON A MODERN DAIRY FARM

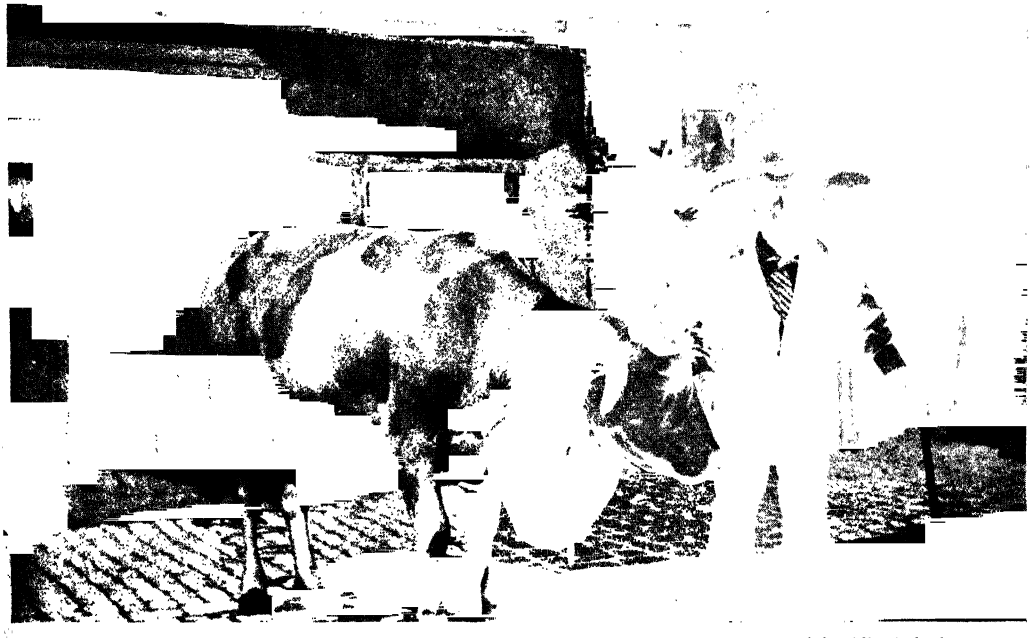
The cows of the United States give between six and seven billion gallons of milk a year. In other words, we use upward of five gallons per month per capita. The average American eats about seventeen pounds of butter annually.



Photograph by Gilbert H. Grosvenor

MILKMAID IN STOCKHOLM, SWEDEN

The "milkman" comes afoot in Sweden, in a dog-cart in Belgium, on the hoof in parts of Spain and South America, with a spick and span team and in a uniform in Washington



Photograph by Alix Bodenheimer

THE LEADING COW, WITH ANTIQUE BELL, LEAVING FOR THE ALPS IN SPRING

The cowbells, which are worn by all cattle while pasturing in the Alps, assist the cowherds in preventing the cattle from straying. These cowherds form a distinct class, who do not own the cattle they tend. The milk given each day is entered in a book, and then made into butter or cheese, the cowherds and the cheesemaker having a right to a certain proportion of the milk for their own use. At the end of the season the proceeds from each cow is turned over to the owner, and the herder receives a share, together with a small sum for each cow tended.

making any actual outlay of cash for his keep.

A very much smaller acreage and a very much smaller investment of labor would provide the necessary alcohol for a tractor-operated farm than would be required to feed the horses the tractors would substitute. Many advanced farmers in various parts of the world have substituted the horse with potato-alcohol-driven motors, and with remarkably successful results. It would be one of the most revolutionary developments of human history if the humble potato should become at once both team and food. The world's present potato crop is approximately large enough to fill two-thirds of the Panama Canal.

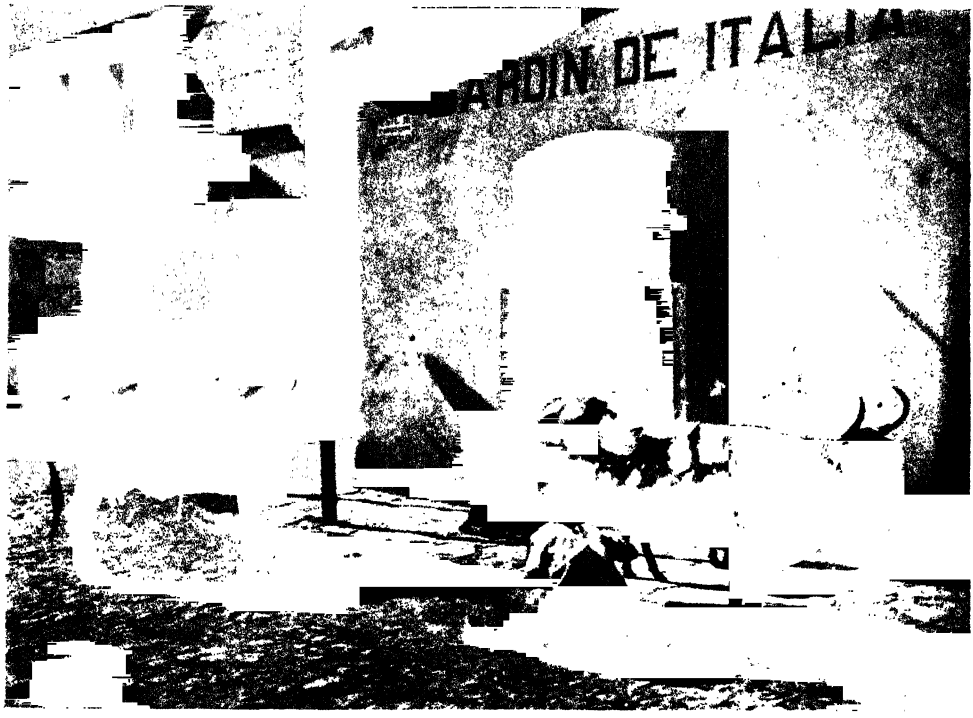
MILK A UNIVERSAL COMMODITY

In any discussion of the world's market basket the importance of milk cannot be overlooked. In the United States alone we produce more than six billion gallons a year. This is an average of nearly one gallon per cow a day. Exclusive of the milk and cream consumed on the farms of the country (which, by the way, represents the bulk of our production), our dairy products are worth $600,000,000 a year (see page 44).

In other words, they are worth enough to build a Panama Canal and pay for the maintenance of the American army and navy every year.

Only one-third of all of the milk produced in the United States is sold from the farm. Much of that which remains is used for domestic purposes there, although a billion pounds of butter is proudly exhibited by the American farm as one of its by-products.

The total production of butter in the United States is around 1,700,000,000



THE MILK PEDDLER: CARACAS, VENEZUELA

pounds. While ten out of every seventeen pounds of our butter is produced on the farm, nearly all of our cheese is made in factories (see page 67).

MILK FROM MANY ANIMALS USED

Milk is used everywhere that man lives, and it is secured from many different kinds of animals. Around the Arctic Ocean the Laplander milks his reindeer and freezes the milk into blocks to keep until needed; in the desert regions of Asia and Africa the natives drink the milk of camels and donkeys; in western Asia there are wandering Tatar tribes who live largely on mare's milk. In many countries the goat is the *poor* man's cow, while sheep milk is widely used in the manufacture of cheese in Europe.

In recent years Russia has built up a large dairy industry in Siberia, and before the war great express trains, sweeping across two continents, carrying nothing but dairy products, were a striking object-lesson of the world's craving for butter and cheese. The Chinese, Koreans, and Japanese use comparatively little milk, their countries being too populous to admit of the keeping of many cows.

BUTTER AND CHEESE TRADE

Little Denmark leads all the countries of the world in the exportation of dairy products, and Danish butter is known wherever good living is enjoyed. Danish dairymen have been imported to all parts of the temperate world to teach the secrets of high-class dairying (see page 45).

The volume of butter which in normal times reaches the channels of international trade amounts to 728,000,000 pounds, which is less than half of the butter production of the United States alone. The per capita consumption of butter in the United States is about 17 pounds. On the same basis, Germany would consume 1,139,000,000 pounds. In 1913 that country imported 122,000,000 pounds more than it exported.

It will be seen from this that if she normally uses as much butter as we do, her shortage would be 10.7 per cent. However, Norway, Sweden, Denmark, and Holland have about 326,000,000



Photograph from U. S. Dept. of Agriculture

THE FATHER OF A GOOD FARMER

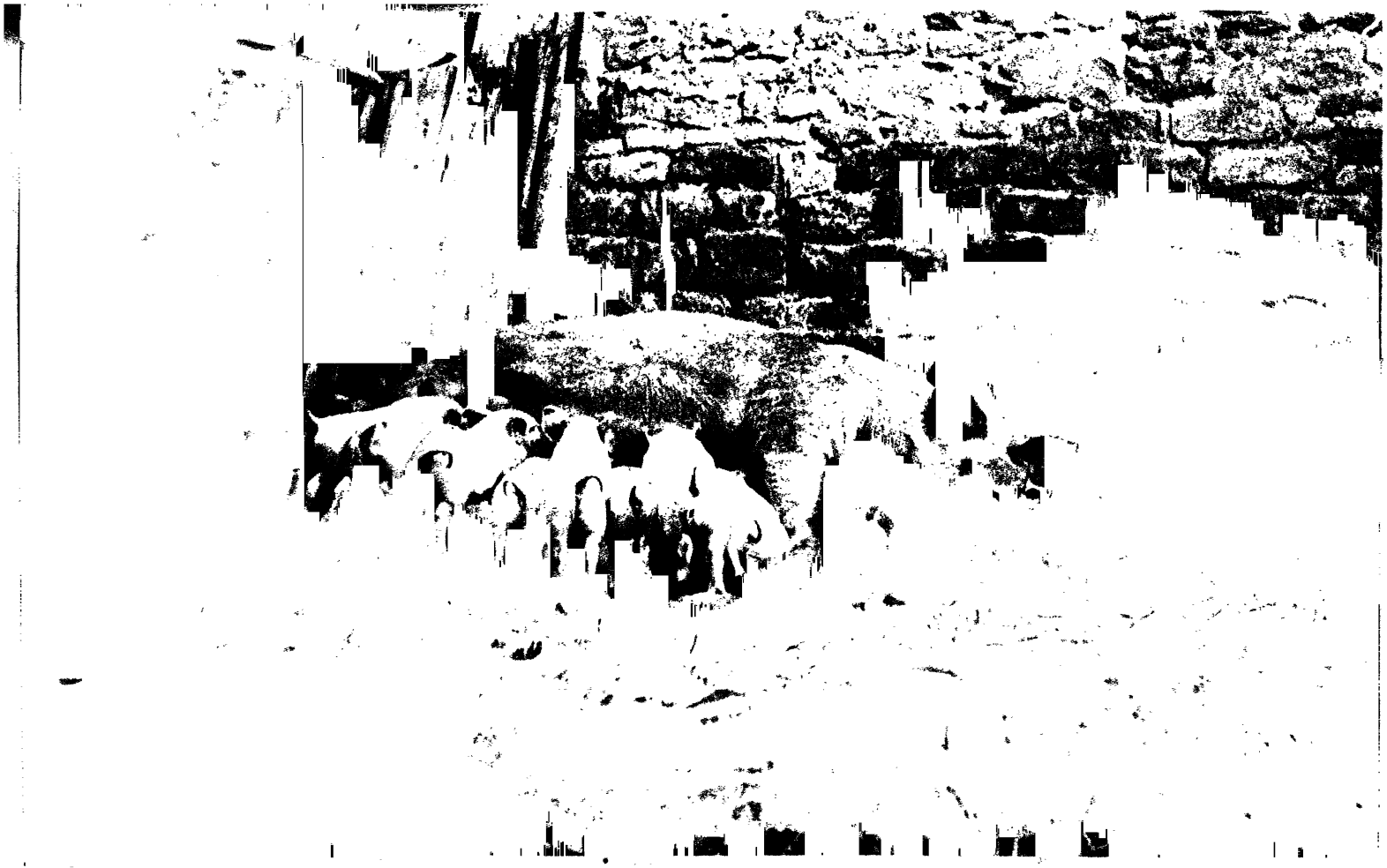
As the child is father to the man, so the youthful member of a boys' corn club is the father of a farmer who will help to solve the food problems of future generations.



Photograph from U. S. Dept. of Agriculture

A MODERN MILKMAID

Twentieth century science is fast emancipating the American farmer's family from the burdens of the past. This young woman from Tennessee so distinguished herself as to win two State championships in women's farm work, and she is today on the payroll of Uncle Sam as an evangelist of the new Emancipation.



Photograph by A. W. Cutler

SELF-INVITED GUESTS AT A STAND-UP LUNCHEON

"Pigs is pigs," but after the first few days each has his own special place at the "table."



Photograph from U. S. Dept. of Agriculture

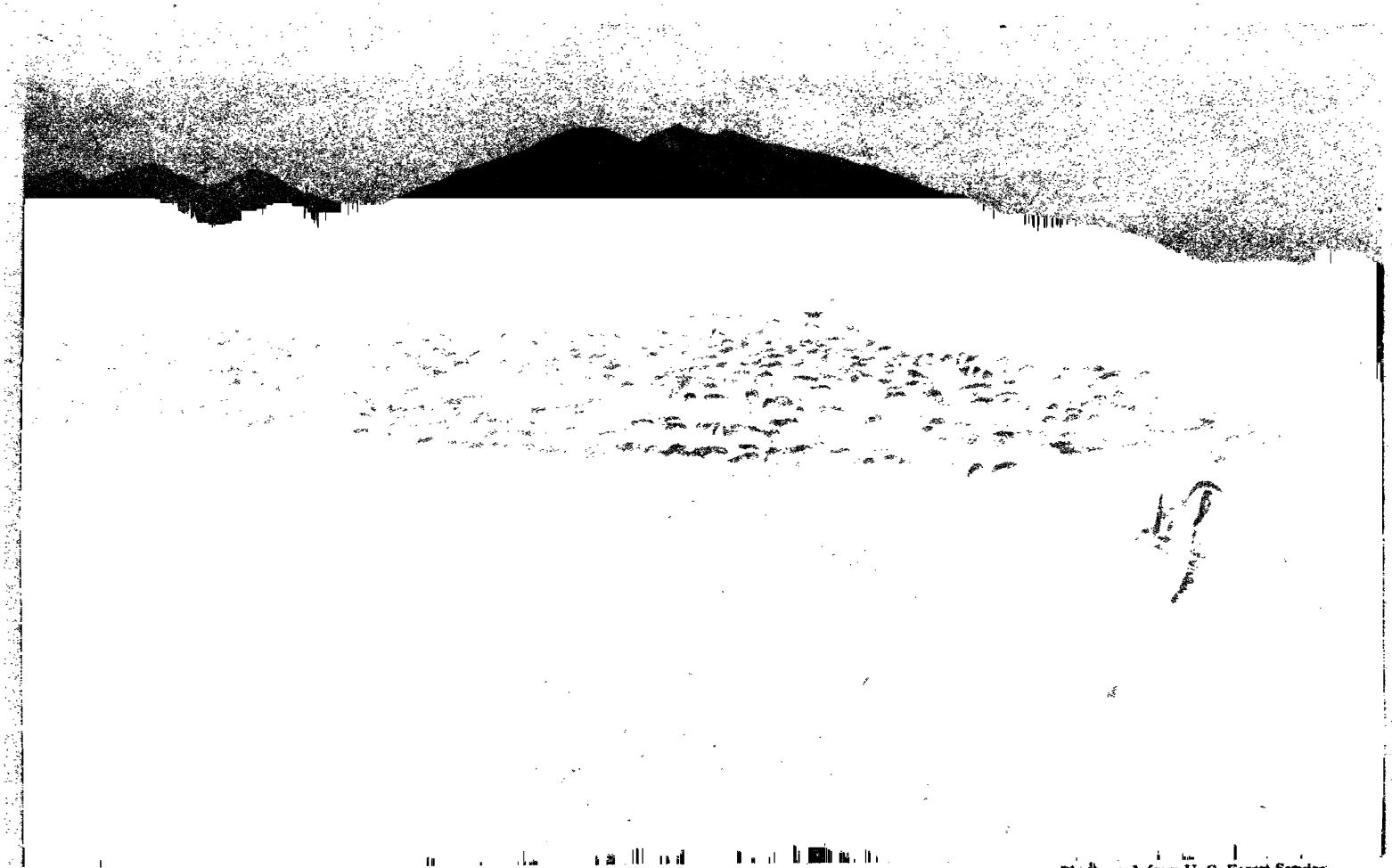
THE GOVERNMENT'S SEAL OF APPROVAL

When the meat inspection law was enacted in 1906, it insured the people of the country that at least three-fifths of the meat they eat is the product of healthy animals slaughtered under proper conditions. There is an inspection of the live animals, and another of their viscera, as well as of the meat itself. Even the railroads are forbidden, under heavy penalty, to ship any meat in interstate commerce that does not have the seal of the Government's approval thereon. There is no Government inspection of meat consumed within the state of origin, or of that slaughtered by retail butchers or on the farm.



Photograph from U. S. Forest Service

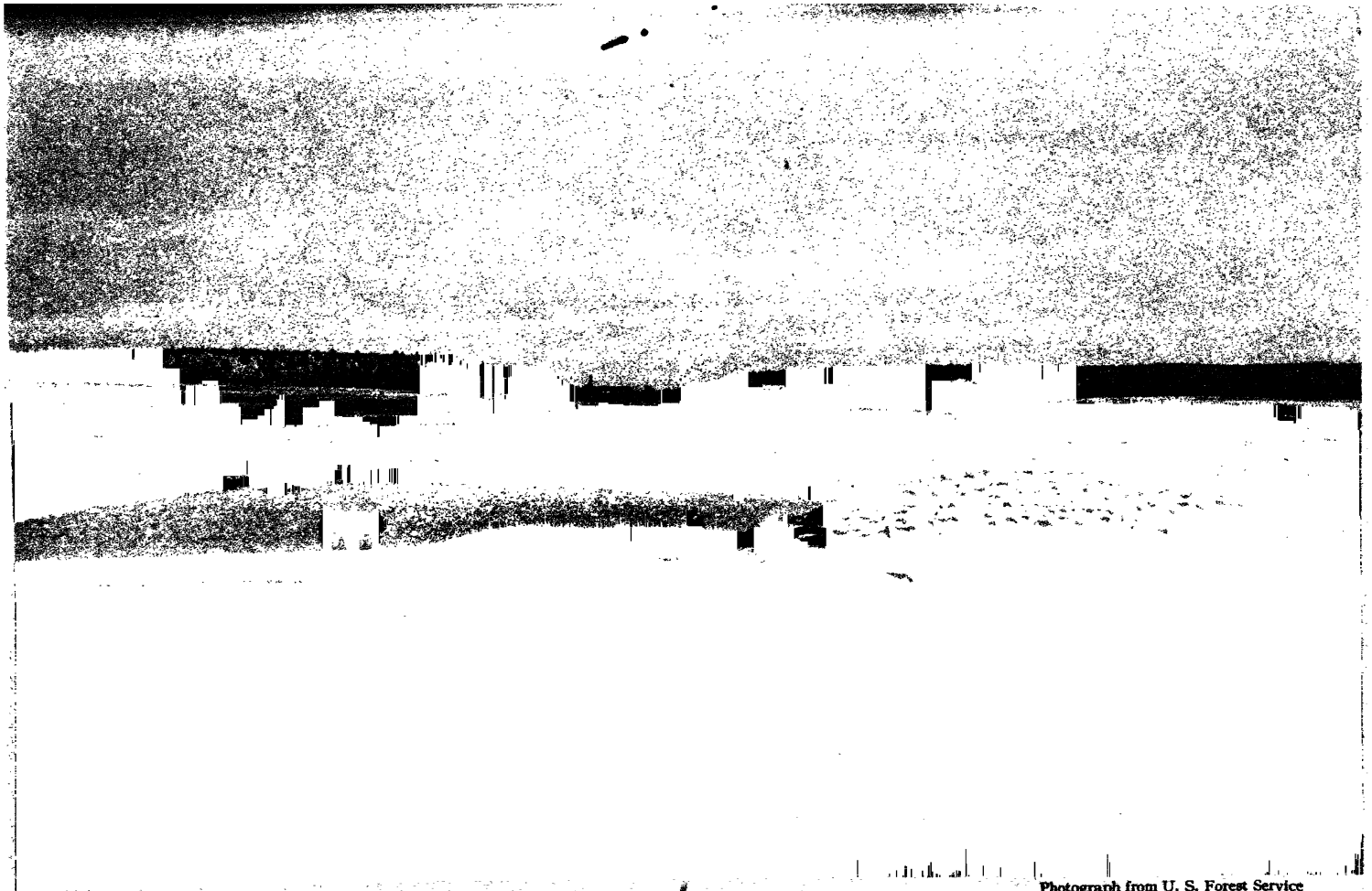
A WESTERN FLOCK RESTING BENEATH THE TREES IN A NATIONAL FOREST RESERVE
Archeological research points to the fact that the sheep probably was the first food-animal domesticated by man.



Photograph from U. S. Forest Service

THE TWENTIETH CENTURY SHEPHERD AND HIS FLOCK

Nowhere does the intelligence of a dog appear to better advantage than when acting as chief assistant to a shepherd. They seem to read the



Photograph from U. S. Forest Service

COMING DOWN TO THE WATER HOLE

There are more sheep in the world than any other kind of domesticated quadruped. There are only one-sixth as many horses, and one-fourth as many hogs. There are 631,000,000 sheep as compared with 434,000,000 cattle.



Photograph by Curtis & Miller

A PEACH AMONG PEACHES—WASHINGTON STATE



Photograph by Brown Bros.

IN THE EMBRACE OF WINTER

Is there anything more beautiful than a laughing, sparkling stream, snow-lined to its brink, and yet so busy in its onward rush to the sea that the encroaching ice dare not bridge its depths?



Photograph by Brown Bros.

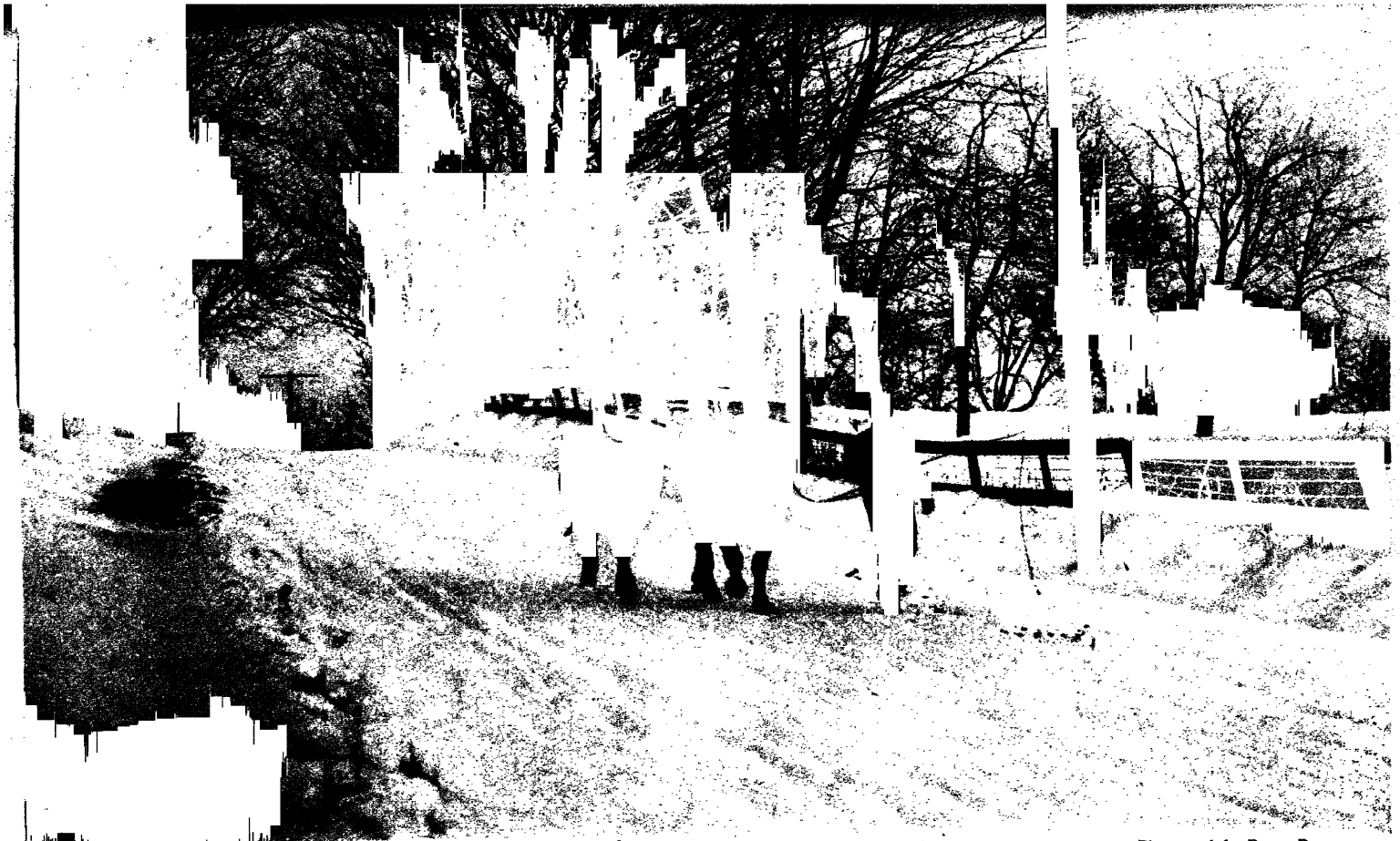
A SNOW-BOUND LOVERS' LANE



Photograph by Brown Bros.

A UNIVERSITY CAMPUS IN JANUARY

The brisk west wind and the snappy clear cold put the stamina of endurance into man and woman.



Photograph by Brown Bros.

OFF TO A WINTER MORNING'S WORK

The hardy New England farmer is up betimes of a winter morning when Nature slumbers beneath a blanket of snow, and an overcoat would be useless baggage to him as he fares forth to his labors.



Photograph by Brown Bros.

THE LITTLE RED SCHOOLHOUSE

Although the little red schoolhouse and the three R's that were taught within its walls are largely giving place to the consolidated rural school and the redirected rural curriculum, it is still enshrined in the hearts of many millions of sturdy Americans who received their early education there.

pounds to export annually, while Austria-Hungary has a surplus of 4,000,000 pounds. In normal times England takes three-fifths of the world's surplus of butter; in 1912, out of 728,000,000 pounds moving in international commerce, the United Kingdom took 435,000,000 pounds.

There are no world statistics of the production of cheese, except of that part moving in international trade. The United States annually produces about four pounds per capita. The total amount imported by all the countries of the world is 531,000,000 pounds, of which the United Kingdom takes 250,000,000, Germany 47,000,000, and Austria-Hungary 13,000,000 pounds. Bulgaria exports 7,500,000 pounds, and Holland and Switzerland have 190,000,000 pounds to give a cheese-hungry world.

VEGETABLES AND FRUITS

The Department of Agriculture estimates that one-fourth of our country's diet consists of vegetables—products of the truck garden. If this is true of the United States, which, next to Australia, is the world's largest per capita meat-eater, it is more true of other countries. Our census returns show that we produce, exclusive of potatoes and sweet potatoes, vegetables to a value of $216,000,000.

The tomato takes first rank, with a $14,000,000 production to its credit; the onion contributes exactly one-half as much to the total as the tomato, while sweet corn makes a successful bid for third place; watermelons get fourth place, with a production valued at $5,000,000, and cantaloupes add $4,000,000 more to the total. Green beans and green peas are $3,000,000 crops. These figures deal almost entirely with the production that gets to the city market and not with the vegetables raised for consumption on the farm (see pages 4 and 107).

THE KITCHEN GARDEN

There is probably no farm-house in all the land so poor as to be without its vegetable garden and its truck patch, and between the dried beans, corn, peas, etc., and the canned cucumbers, beets, tomatoes, ketchup, and what not, the rural housewife takes her family into the winter with the assurance that, high cost of living or no high cost of living, there will be no dearth of vegetables on her table.

If the products of the vegetable garden figure extensively in the world's diet, they play no greater rôle than the products of the orchard, vineyard, and berry patch. The total yield of the latter, according to the last census, is worth $222,000,000 a year.

Orchard fruits are produced to an annual value of $140,000,000. We produce a bushel and a half of apples per capita, a third of a bushel of peaches, two quarts and a half of strawberries, and other things in proportion. Grape-vines and citrous trees each yield $22,000,000 worth of fruit a year, while our berry crop is valued at $29,000,000 (see page 73).

While most of our fruits and vegetables come to us in their natural state or canned, the country annually produces millions of dollars' worth of dried fruits—a production which figures more largely in other parts of the world than in our own.

THE ART OF CANNING

It is only a little more than a century since the fruit-jar came into use. Before that the only way of keeping the fruits and vegetables that are now canned was to dry them or put them away in sugar or salt. The invention of the modern process of canning is credited to Nicholas Appert, a Frenchman. His method was to put the food to be preserved in glass jars, set them in boiling water, and, when the contents were thoroughly heated, seal the jar (see also page 1).

Although Napoleon gave Appert twelve thousand francs for his work, he simply had built on foundations well laid by Spallanzani nearly a half century before. The apparatus used by Appert in his canning processes was very crude, but his discoveries laid the foundation for one of the important industries of modern times, and have proved a boon to the urban population of the earth.

While Napoleon Bonaparte paid for the discovery of the canning process, his

enemy, England, was quick to take up the discovery and to utilize it for her own purposes. About 1815 Ezra Daggert brought to the United States a process for canning salmon, lobsters, and oysters. This process was gradually extended to pickles, jellies, and sauces.

HOUSEWIVES ADOPT SCIENTIFIC DISCOVERIES

It is rather striking to pause and reflect that in a single century humanity has progressed to such an extent that the most ignorant housewife in America can now do work that formerly defied the best scientists of the world (see page 107).

Only the first centennial has passed of William Underwood's invention of a process of canning tomatoes, and it is only seventy-eight years since Isaac Winslow learned how to can corn at Portland, Maine. Today the glass jars of Appert have been succeeded, except in the household canning art, by the tin can, and many wonderful machines have been devised to save labor in the canning industry.

There are hulling machines which will take green peas out of the pods at the rate of a thousand bushels a day; there are separators which will grade the peas according to size; there are corn-cutters which remove the grain from the cob at the rate of four thousand ears an hour, and silking machines which work at equal speed; and there are automatic machines which will fill twelve thousand cans a day. If Nicholas Appert could come to life and go through a modern cannery, with its wonderful equipment, he would doubtless marvel at the mighty oak that grew from the tiny acorn of his discovery.

THE PLACE OF POULTRY

There are no statistics showing the number of domesticated fowls the world possesses, but if the United States' ratio of three per capita were the rule, there would be some five billion of them. It is probable, however, that there are not half that many.

The annual product of the American chicken yard is estimated at $500,000,000. During the last census year the American hen produced nearly twenty billion eggs, of which eleven billion were sold. It will be seen from this that the American farmer keeps a liberal supply of eggs for his own table and for hatching purposes. His receipts from the sale of eggs totaled $202,000,000 (see pages 80 and 81).

We annually raise nearly a half billion chickens in the United States. Out of 488,000,000 raised in the last census year, the farmer kept all but 153,000,000 for his own purposes, which again shows that the farmer's table is not skimped in order that his urban neighbor may eat well.

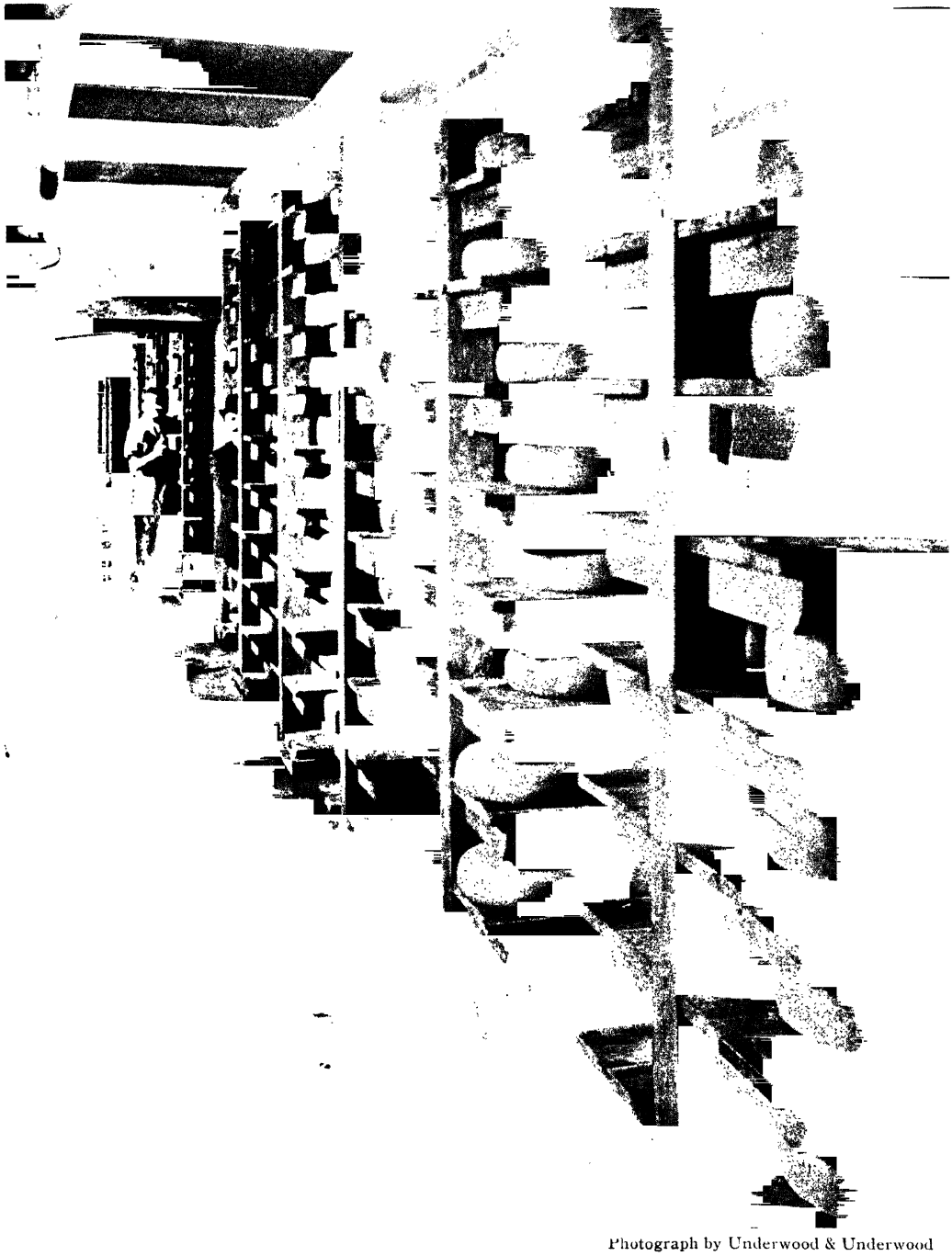
THE INDUSTRIOUS BEE

Nowhere else in the world is the majesty of small things more strikingly revealed than in the story of the production of honey in the United States. That great decennial interrogation mark which marches every ten years through the homes of the American people and asks them a thousand and one questions, has ascertained for us that the bees of the country annually produce twenty-seven thousand tons of honey. That means fifty-four million pounds.

Truly the busy little bee must improve each shining hour to give to the American people fifty-four million pounds of honey, in addition to providing for its own needs. The number of trips from hive to flower and from flower to hive with their tiny loads of honey-making materials that the bees must have taken to bring us these fifty-four million pounds of honey defies estimate, but they afford us an inspiring lesson of what the faithful doing of small things may accomplish.

THE SUGAR INDUSTRY

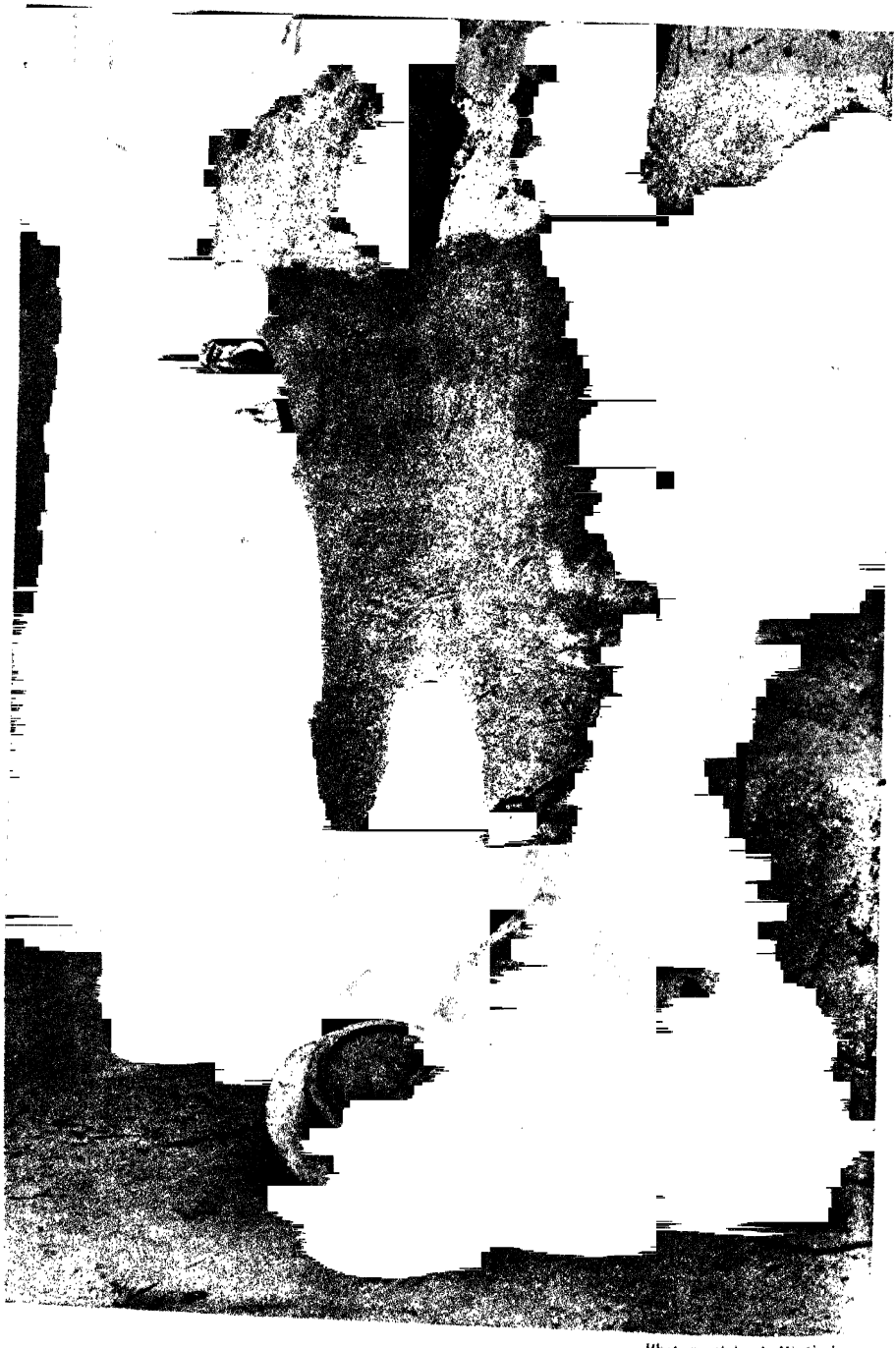
When one writes of honey his mind turns to sugar—a crop which occupies a very important place in the world's market basket. Humanity always has had a sweet tooth, and the day when sugar was first made from cane is so remote that history is not certain that it can fix the date. And yet in one generation the world has increased its sugar production more than nine-fold. Forty years ago it took only 2,200,000 tons to satisfy the world's sweet tooth; today it takes more than 20,300,000 tons. And still the world is hungry for sugar (see page 87).



Photograph by Underwood & Underwood

HUNDREDS OF CHEESES CURING IN THE RACKS OF AN UP-TO-DATE FACTORY

The people of the United States eat a little more than three pounds of cheese a year. The cheese-making industry has almost entirely passed from the farm to the factory.



Photograph by A. W. Cutler

ARAB WOMAN AND HER GOATSKIN CHURN

All people must have oil or fat in some form. The Eskimo likes seal blubber, the Spaniard wants his liberal allowance of olive oil. Butter from mare's milk, camel's milk, or sheep's milk is in demand among various peoples.

The American people have increased their annual per capita consumption in that time from eighteen pounds to eighty-nine pounds. The Australian Commonwealth has the sweetest tooth of all the countries of the world, its per capita consumption being 109 pounds. Denmark has second place and Canada third; the United States comes fourth.

The sugar industry is a profitable one to the grower; it was recently estimated that the value of the sugar crop to the grower is $815,000,000, while the price paid therefor by the consumer approximated $2,000,000,000.

A TRADE WITH UPS AND DOWNS

The sugar consumed in any country fluctuates quite appreciably with financial conditions. During every financial depression the per capita consumption declines, and whenever prosperity reaches high tide, sugar consumption approaches its climax. One might write the financial ups and downs of the world in terms of sugar.

The world's production of sugar is divided half and half between sugar-cane and the sugar-beet. Sugar-cane is a very ancient crop, and in many parts of the world one of the most profitable grown. The cane has a preference for the tropics, although it is able to wander as far north as the southern part of the United States.

The sugar-beet, on the other hand, loves a cooler climate, and consequently adds immensely to the world's possible sugar-producing area. While Maggraf discovered that sugar could be made from the beet many years before the Napoleonic wars, it was not until that time that his discovery was put to any large commercial use. There is no difference between the sugar derived from cane and that extracted from beets (see page 86).

A TASTE FOR CANDY

The taste of the American citizen for sweet things is emphasized by his remarkable consumption of candy. We eat a half billion dollars' worth every year, which is said to be more than half the world's total production. The candy habit is one that is not easily changed, and people are inclined to do without sweets unless they can secure their favorite kinds. The candy importers of New York find it necessary to purchase candy from the most remote regions of the world in order to satisfy the demands of immigrants who come from those regions.

The Chinese appear to have first established the art of candy making. Most interesting of their candy products are the candy oranges and the candy eggs, the former the peel of an orange filled with native candy, and the latter the shell of an egg filled in the same way. These have been manipulated in such a way that the purchaser cannot find the opening through which the original contents were ejected and the sweets inserted. To reach the contents of the orange, it is necessary to peel it, and one has to break the egg to get the candy out.

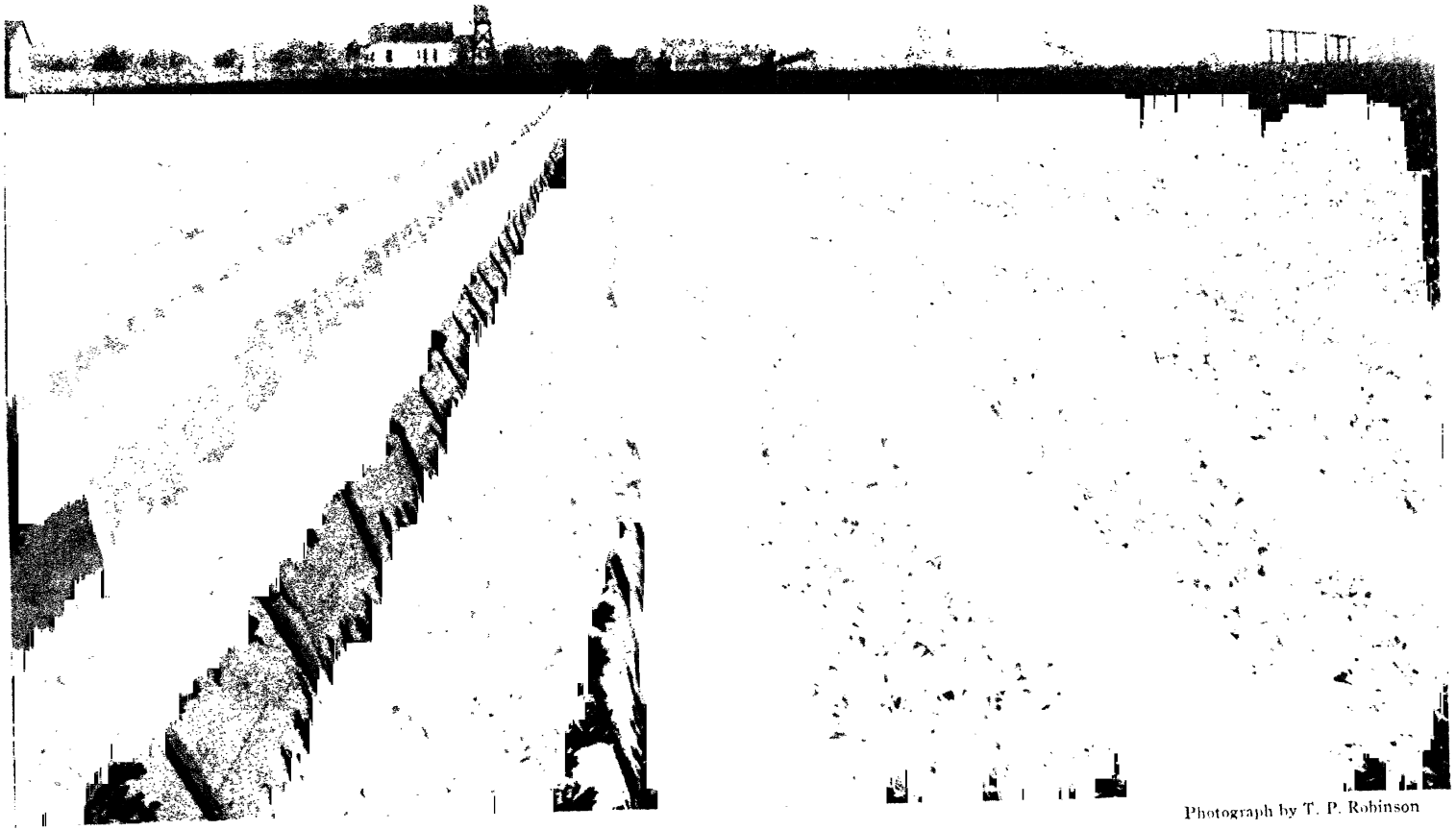
A noted physician has declared that sweetness is to the taste what beauty is to the eye and music to the ear. He says that more than one-half of all the foods in the world have a sweet or sweetish taste, while only one-third possess a salty taste and one-tenth a bitter or sour taste.

He also points out that man is not the only creature with a sweet tooth. One can win the affection of a horse quicker by feeding him sugar than in any other way, while the bear and the fox, in their ravages on the wild honey of the forest and field, probably experience a satisfaction resembling that of a hungry child who surreptitiously gets sweets from mother's cupboard.

Sugar is manufactured from raisins in practically all of the countries of southern Europe and western Asia. There are two forms of raisin sugar imported into New York, one principally from Asia Minor and the other mainly from Spain. The Turks add to the delicacy of grape sugar by the use of small quantities of rosewater.

CIVILIZATION'S COFFEE CUP

The people of the world annually consume more than two and one-half billion pounds of coffee—enough to load a train of cars reaching from Philadelphia to



Photograph by T. P. Robinson

A CELERY FARM IN MICHIGAN

Celery is a plant of recent domestication and is one of the acceptable immigrants of the vegetable kingdom which have come to our shores



Photograph by N. H. Darton

PICKING ORANGES IN CALIFORNIA

Because of the great freeze of two decades ago and the competition of the spirited Western growers, Florida has been forced to yield first place in the orange industry to California

Pittsburgh. Three-fourths of this is grown in Brazil, a country that has become rich from its coffee industry alone. Europe and North America bear approximately the same relation to the consumption of coffee that Brazil does to its production, these two continents using nearly four-fifths of all the coffee the world produces.

Holland is the greatest coffee-drinking nation on the globe. It uses 15⅛ pounds per capita annually, while we use 9½ pounds, Germany 5⅛ pounds, Austria-Hungary 2⅖ pounds, and the United Kingdom ⅔ of a pound. On the other hand, we use less than one pound of tea per capita, where the United Kingdom uses nearly seven pounds. Canada is about two-thirds English and one-third American in its use of coffee and tea; it shows a decided preference for the tea, but drinks less of it than the mother country, making up the difference with coffee. The Germans and the Austro-Hungarians use only a negligible quantity of tea.

The coffee plant is a shrub which, under cultivation, grows from 4 to 6 feet high. In its wild state it grows three or four times as high as in its cultivated state. The dwarfing of the plant increases the crop and facilitates picking. The leaves are of a fresh green color; the flowers are white and have an odor strongly resembling jasmine.

The green coffee berry of commerce is nothing more nor less than the seeds of the coffee "cherry." These "cherries"



Photograph by Curtis & Miller

A BRANCH OF JONATHANS: YAKIMA VALLEY, WASHINGTON

From the days when Andrew Stevenson, American minister to the court of St. James, presented a lot of Albemarle pippins to the Queen of England, America has always produced apples fit for any queen. Our apple crop is worth several times as much as the banana crop of both the Americas.



Photograph by Curtis & Miller

TOKAY GRAPES: PACIFIC COAST FRUIT BELT

"California's supremacy as a grower of the newer crops is shown all along the line. Out of the nation's 6,793,000 pounds of almonds, that State grows 6,692,000 pounds; out of 4,150,000 bushels of apricots, it shows a production of 4,066,000 bushels; out of 35,000,000 pounds of figs for the entire country, 23,000,000 belong to her credit; out of the country's total of 2,571,000,000 pounds of grapes, California is credited with 1,979,000,000 pounds" (see text, page 79).

turn crimson on ripening. They are then picked, the pulp is taken off by machinery, and the two husks which lie between the pulp and the seeds themselves are removed. The coffee has to be thoroughly dried before the husks can be taken off, and on many plantations there are whole acres of concrete floors for this drying process.

When run through the machinery for the removal of the husks, these latter are blown away like chaff, and the coffee grains are run over sieves so arranged as to grade them and bag them according to size, ready to be shipped to the world's markets.

PRODUCTION OF TEA

The growing of tea is largely an Asiic industry. The tea plant is a hardy evergreen shrub, growing from 12 to 15 feet high in its wild state, but dwarfed under cultivation. It prefers a subtropical climate where the rainfall approximates 50 inches a year. After the leaves are picked the tea reaches its commercial state by two routes—one producing the black variety of the tea and the other the green.

The leaves are first dried in the sun in the case of black tea, and in pans over fire in the case of green tea. In both processes the leaves are next rolled until soft. Black tea is next fermented, then fired, and finally sorted. Green tea is withered again following the rolling process, sorted into bags, and then slowly roasted.

In China most of the tea gardens are

small, each farmer producing enough for the consumption of his own family, and a little surplus which he sends to the market. The Department of Agriculture has interested itself in the production of tea in this country, and has issued a bulletin which reveals the fact that in South Carolina and elsewhere on the southern Atlantic seaboard America has proved a successful grower of this plant.

THE BANANA INDUSTRY

It is not so many years ago that the banana was a tropical crop, grown only for home consumption by residents of the river valleys of the tropical countries. It was sold mainly by street venders in the villages and towns, and only in exceptional cases did any reach American and European markets; but today we are importing more than 40,000,000 bunches of bananas into the United States every year, and the value of these importations ranges around $14,000,000.

The first bananas ever imported came in 1869, and in many parts of the country it was twenty years later before they came to stay. It has been only in recent years that the banana reached Europe. England now buys about 7,000,000 bunches a year (see page 89).

A visit to a banana plantation is an interesting experience. The banana tree wants a rich soil; but, given that, no other tree known can grow faster. In preparing a banana plantation, the jungle is first cut down, and sprouts are planted in rows about six feet apart. By the time the tree is ready to bear, every bit of the jungle debris has disappeared, except that here and there an occasional hardwood tree still lies prone upon the ground. One can scarcely believe his eyes when he sees how quickly the processes of decay so nearly obliterate the last vestige of the felled tropical jungle.

Each tree grows one bunch of bananas. When they have reached maturity, but are still green, the tree is cut about half way up its trunk, and the upper part falls gently into the hands of the banana gatherers. The bunches of green bananas are put on hand-cars and hauled to central places, where the banana trains come along and pick them up.

SINGING AS THEY WORK

I have seen 35,000 bunches of bananas loaded into the hold of a ship in a single night, the West Indian negroes singing after the fashion of the hand-drill gangs on railroad and other construction work in the United States. The people who handle bananas on the big plantations of Central America and the West Indies so lose their taste for this fruit that they seldom keep them on their tables at all.

Once I was on one of the biggest plantations in the world, in Guatemala, and, although there must have been several hundred thousand bunches on the trees that were in sight, there was not one ripe banana around the entire settlement of the plantation headquarters.

The banana and its cousin, the plantain, are found in most tropical countries. To the native of Central Africa they yield not only a part of his food and some of his drink, but he gets from them his string, his soap, and his clothing.

He cooks the green fruit of the plantain as a vegetable, and serves the ripe fruit as a dessert. With the banana he makes his flour and sometimes his coffee. He uses the leaves to thatch his house, and also makes them serve him for paper, table-cloths, and napkins. He often uses the stems for fences, the pith as a sponge, and the fiber as a string.

THE PINEAPPLE

Another native of America that has won favor in every part of the world where it is known is the pineapple. Jack Frost is its deadly enemy; therefore it grows only in tropical and subtropical communities; but the refrigerator ship has enabled it to wander to every point of the compass where men and women who love good things to eat are to be found.

Hawaii leads the world in the production of pineapples. It has brought to its fields every variety of this luscious fruit that might add, by cross-breeding, to the size and flavor of its product, so that today canned Hawaiian pineapple and raw Hawaiian sugar serve largely to keep the American flag on the high seas in Pacific waters (see page 88).



Photograph by T. P. Robinson

A BUNCH OF GRAPEFRUIT

Some one has pronounced a grapefruit a lemon that has had a chance. However that may be, Florida finds that they have given her a chance to add $2,000,000 a year to her income.



GATHERING DATES IN ARIZONA

The date was one of the earliest arrivals of all of our plant immigrants, having been brought to America by the Mission Fathers and given a foothold in Arizona and California. While these two States produce a considerable crop of this luscious fruit, still we import the major portion of our supply.



Photograph and copyright by Underwood & Underwood

STRAWBERRIES RIPEN EVERY DAY OF THE YEAR IN SOME PARTS OF CALIFORNIA AND MEXICO

Irrigation, peace, and good farmers would make Mexico a granary of plenty. A touch of water to its thirsty highland soil transforms desert into garden.



Photograph by A. W. Cutler

FORBIDDEN FRUIT: ENGLAND

Adam and Eve and the apple. When Adam got the apple back, there was not much left but the core.

Some plantations are found in Florida, but the frosts frequently nip them there, so they are often grown under sheds to guard them from the cold. The pineapple contains vegetable pepsin, and there are many cases of derangements of the stomach in which it is a valuable aid to the physician.

The orange, the lemon, and the grapefruit are grown where the pineapple thrives, and sugar-cane grows there, too. Traveling through our busy little island, Porto Rico, orange and lemon groves alternate with sugar plantations and pineapple fields. When one comes to the upland region, the coffee "finca" takes the place of the pineapple field, for coffee is the most fastidious of all plants; it will not thrive in the lowlands, and it refuses to grow well at points having too much elevation.

THE OLIVE'S POSITION

If one should draw a ring around the Mediterranean Sea back a hundred miles or so from the shore, and another around southern California, he would circumscribe the two great olive-producing regions of the earth. Although the olive is said to have come originally from Asia Minor, Italy now grows more of them than any other country, while Algiers,

Tunis, France, Spain, Greece, and Asia Minor still give important contributions to the world's crop.

The olive tree has been imported to America, and has thrived well in our southern Pacific regions. There are trees in California which were planted before we signed our Declaration of Independence, and they are still bearing well. California's contribution to the world's olive crop is about 56,000,000 pounds a year.

In southern Europe there is a saying that the man who plants olive trees lays up riches for his grandchildren, and many of the people claim that olive trees often live a thousand years.

The trees are planted from cuttings, sprouts, or the gnarled wooden bulbs at the base of the trunk. They are set about 40 feet apart and begin to bear at two or three years of age, although it requires seven years for them to become commercially profitable. They do not reach their maximum bearing qualities until about thirty years old. A ten-year-old tree may have six or seven gallons of olives on it, while one thirty years old may produce as many as fifty gallons.

In southern Europe and in other lands around the Mediterranean Sea, olive oil to a large extent takes the place of butter. It is used not only in salads, but upon bread and for cooking vegetables. In some localities ripe olives and green oil take the place of both bread and meat. Many a Spaniard, when upon a long journey, ties a wicker basket of olives to his saddlehorn and eats his meals as he travels.

CALIFORNIA'S PREËMINENCE

The systematic growing of nuts is a comparatively new industry in the United States, yet it is one that promises to develop into an important source of food in the future. At the last census there were five million nut trees in bearing in the United States and more than three million more approaching a bearing age. They produced a total of 62,000,000 pounds of nuts, having a value of nearly five million dollars—approximately a dollar a tree.

English walnuts took the lead in weight produced, giving nearly one-third of the total weight and one-half of the total value. The pecan led in the number of trees, with nearly one-third of the total in bearing and more than one-half of the total too young to bear; but they contributed only one-sixth of the total production in weight and one-fifth in value.

California's supremacy as a grower of the newer crops is shown all along the line. Out of 6,793,000 pounds of almonds grown in the entire country, that State grows 6,692,000 pounds; out of 4,150,000 bushels of apricots, it shows a production of 4,066,000 bushels; out of 35,000,000 pounds of figs for the entire country, 23,000,000 belong to her credit; out of the country's total of 2,571,000,000 pounds of grapes, California is credited with 1,979,000,000 pounds.

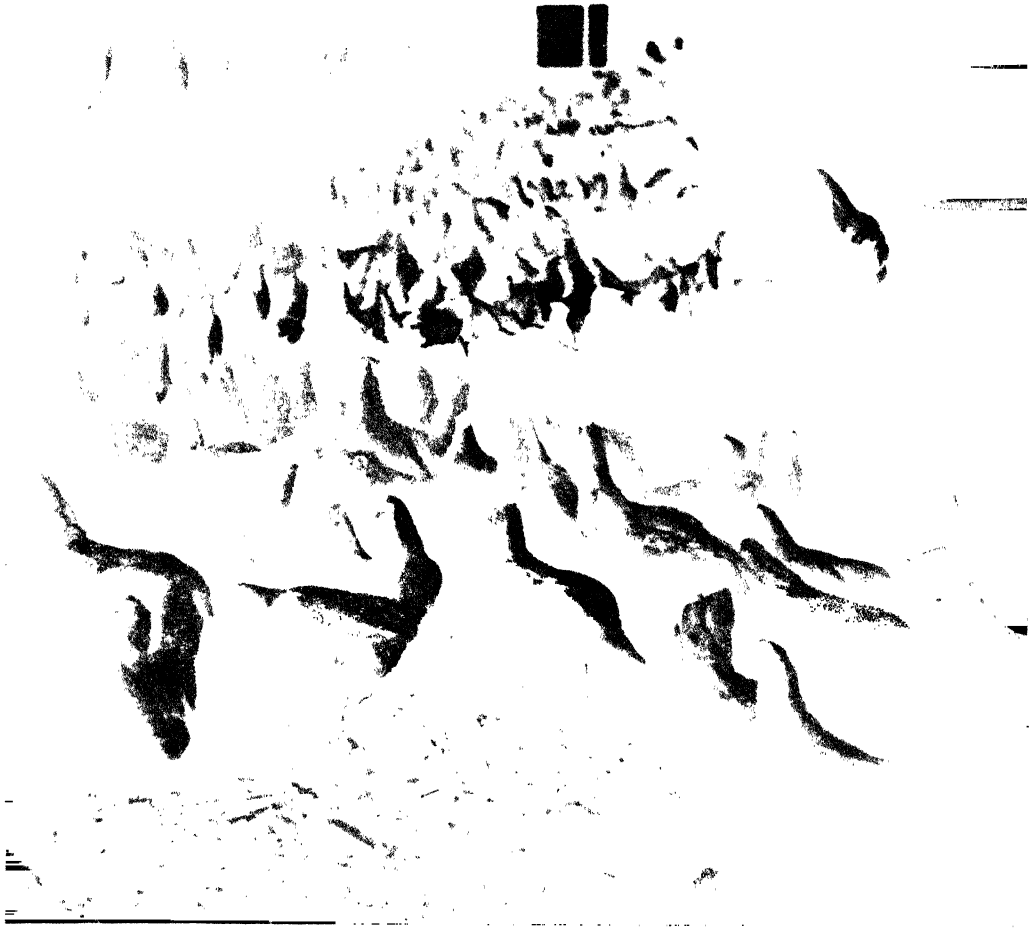
Practically all of the country's lemons come to us from that State, as does nearly half of the total nut production; nearly all of the country's 16,405,000-pound olive crop; more than two-thirds of the total crop of oranges, amounting to 19,405,000 boxes; a fourth of the peaches and nectarines, and 9,317,000 bushels of plums and prunes out of the country's total yield of 15,480,000 bushels.

SUNFLOWER-SEED OIL

In Russia the people have found the seeds of sunflowers a substitute for olives in the making of oil. The native Russian eats sunflower seeds as we eat peanuts, keeping a handful or so in his pocket and nibbling away at them from time to time. Each sunflower has from eight hundred to one thousand seeds and about forty million pounds of them are raised every year.

An acre of sunflowers yields about sixty bushels of seeds, and these, when pressed, produce about fifty gallons of oil. The Russians use sunflower-seed oil almost exactly as we use cotton-seed oil, only they make a greater use of it as a substitute for olive oil than we do. Much of the oil is used for lighting and making candles and soaps.

The date is largely an around-the-Mediterranean crop. It is grown by irrigation in the oases of the Sahara Desert, in the valley of the Nile, in the fertile



Photograph and copyright by Keystone View Co.

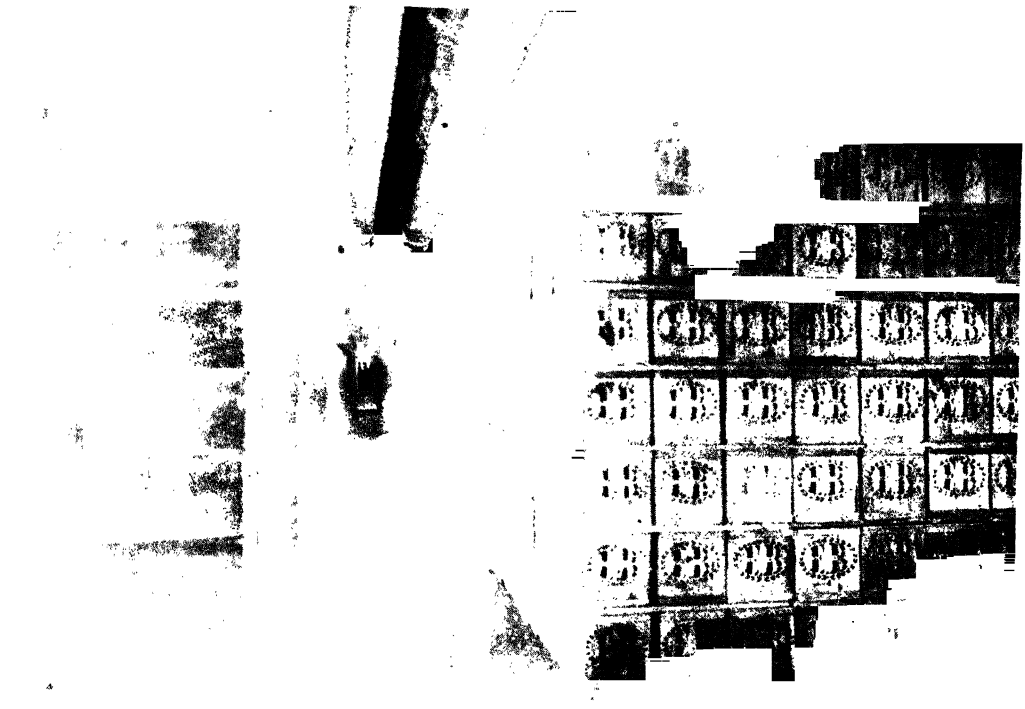
SCENE IN A MODERN HENNERY

The American hen could finance the digging of a Panama Canal every year. She presents the country with twenty billion eggs and nearly half a billion young chickens annually.

spots of the desert of Arabia, and especially along the Shat-el-arab River, at the head of the Persian Gulf. This river is formed by the union of the Tigris and Euphrates, and it flows from their junction for a distance of 70 miles to the Gulf of Persia through some of the richest soil and one of the hottest climates in the world. Here the date palm thrives as nowhere else, and practically the whole land is given up to its cultivation. The date has been in America for generations, having been carried to our southwestern country by the Mission Fathers along with the olive. When grown systematically, it has rewarded those who have cultivated it with fair returns (see page 76).

SPICES AND FLAVORS

The orchid family not only yields some of the most beautiful flowers of which we know, but it also produces one of the most used of all the flavoring agents that figure in the art of cooking. Vanilla is made from the fruit of a climbing orchid, a native of tropical America, but now grown in Java, Ceylon, and other parts



Photograph and copyright by Underwood & Underwood

THE HOME OF THE COLD-STORAGE EGG

of the Orient. The Asiatics use it to flavor their chocolate.

The fruit is a pod. This pod is dried and cured with great care in order to obtain the desired flavor. The characteristic odor is developed during the process of fermentation, which takes place while the pods are drying. The aroma and flavor are due to the vanillin that gradually crystallizes from the pod. The well-cured pods, either whole or powdered, may be found on the market as the vanilla bean or powder; but the more common form is the fluid extract, which is the active principle of the bean drawn out by the use of alcohol.

The American people are the largest users of pepper in the world. In 1913 we bought 27,000,000 pounds of this commodity. It is said that pepper was worth its weight in gold during the days of the Roman Empire, and that the first vessel which sailed around the Cape of Good Hope went to procure this favorite spice. The black variety is prepared from the dried unripe berry of a vine which was grown first in southern India, the East Indies, Siam, and China, and in the later ages in the West Indies. For a long time the Dutch nation controlled the trade and tried to confine pepper cultivation to Dutch possessions.

White pepper is generally supposed to be produced from a different spice, but it is, in reality, the same fruit prepared by a different method. It is generally considered better, but, as a matter of fact, it has not as good a flavor as the black variety and is more expensive, the only advantage being in the matter of appearance.

CINNAMON AND CLOVE GROWING

Cinnamon is the inner bark of young shoots of a certain species of cinnamon tree. The shoots are cut carefully from the tree, and the bark is split longitudinally and removed. It is then piled in heaps and allowed to ferment. The bark shrinks on drying, and is then put into bundles ready for exportation.



Photograph by Erdelyi

GOOSHERD ON THE BANKS OF THE TISZA: HUNGARY

The goose is much more frequently reared in Europe than in America. It is a bird that has so lately been domesticated that it is sti[ll] **Europe called the "lag" goose, bringing** back to mind the time when some of them "lagged" behind in the days of their migration and p[er]m **themselves finally to be domesticated.**



Photograph by A. W. Cutler

PEASANT WOMEN READY TO START TO MARKET: MEZOKOVESD, HUNGARY

Cloves are the unopened flower buds of a beautiful evergreen tree which grows mainly in the Spice Islands. After picking, the buds are thrown on grass mats on the ground and allowed to dry in the sun, care being taken to shelter them from the dew at night. In about one week they are ready to be packed for exportation. They contain about 16 per cent of a volatile oil which is used largely in the manufacture of perfumery, soaps, and candles.

The nutmeg is the dried kernel of the seed of the fruit of a tropical tree somewhat resembling the orange tree. It is a native of the Malay Archipelago, but is also grown largely in Asia, Africa, South America, and the West Indies. The fruit is gathered when fully ripe, and, as in the case of coffee, the pulp is discarded. The seeds are then dried in the sun or by artificial means. Later the outer coating is broken and the nutmeg or kernel taken out. The outer coating is also used commercially, being exported under the name of mace.



A DROVE OF KANSAS TURKEYS

The heavy draft that Thanksgiving and Christmas makes on the turkey flocks of the country is shown by the fact that the opening of spring finds less than four million alive in the whole United States. Texas is the foremost turkey State, with Missouri ranking second. The American farmer told the census enumerator in 1910 that his turkeys were worth $1.70 each.



Photograph from Henry Ruschan

BUSY BIDDY AND HER BROOD

Sago is made from the pith of the sago palm. This pith is ground into a meal, and the extracted flour, when dried and roasted, becomes the pearl sago of commerce. In many tropical countries the bamboo takes the place of asparagus. The tender shoots of the bamboo are boiled, stewed, or pickled in vinegar.

OTHER TROPICAL PRODUCTS

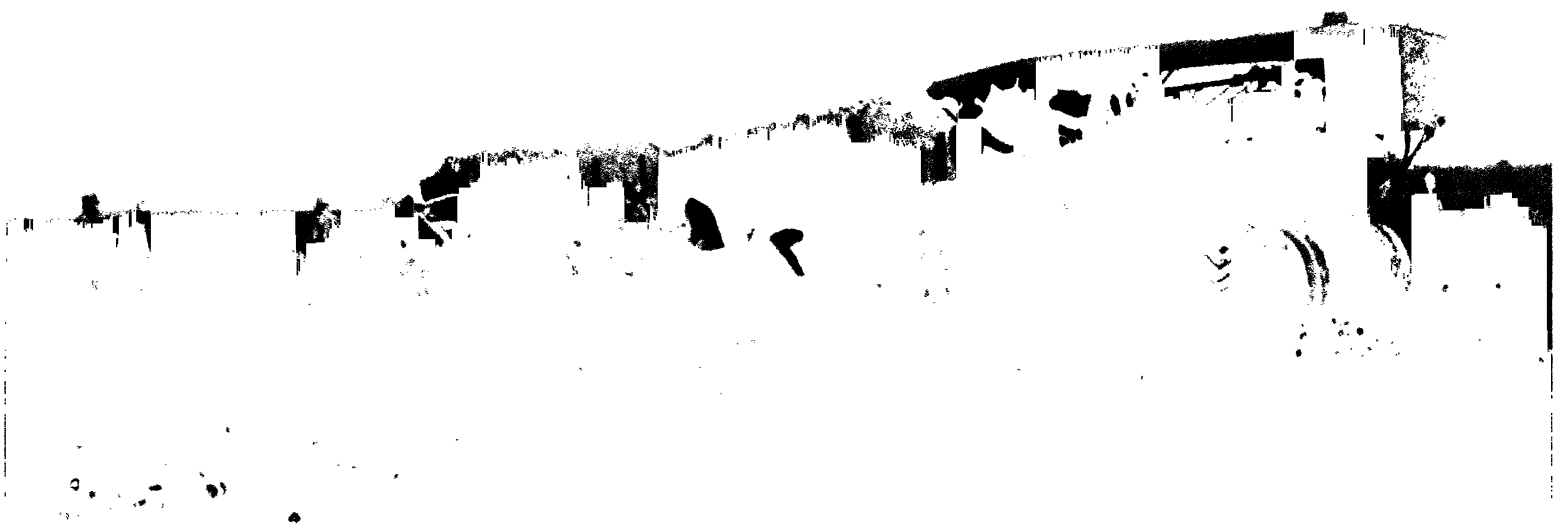
Tapioca is prepared from the starch of the cassava, a plant grown largely in Brazil and other tropical countries. The starch is extracted, put into shallow pans, and subjected to a low heat. As the moisture is driven off, the heat is gradually raised until the mass forms into irregularly shaped kernels. The cassava plant is closely akin to our own milkweed.

Cocoa is grown on trees which reach an average height of from 20 to 30 feet. The fruit is a pod possessing a thick, tough rind inclosed in a mass of tissue. Embedded in this tissue are some forty or more cocoa beans covered with thin shells. The pods are picked when fully ripe and the seeds extracted and sent to market.

SOME OF THE EARTH'S FREAK FOODS

There is no accounting for the freaks of human appetites. The Roosevelt story of how he got the best work out of the men with sharp-filed teeth by promising them the choicest bits of raw hippopotamus and rhinoceros steak for speed in skinning, will be recalled by many who read the article in the magazines at the time of his African expedition. Capt. Robert H. Bartlett, commander of the *Karluk*, which carried Stefansson to Arctic waters, says that on his return from Herald Island to northern Siberia, he found raw Polar bear meat tasting better than any piece de resistance he had ever eaten in the home country.

The Frenchman likes his snails and wonders how any one who accepts oysters can refuse them. In Canton, China, rats sell for fifty cents a dozen, and a dog steak brings more per pound than a leg



Photograph from U. S. Department of Agriculture

STEAM TRACTION ON A SUGAR-BEET FARM



Photograph by A. Nielen

A HAWAIIAN SUGAR PLANTATION

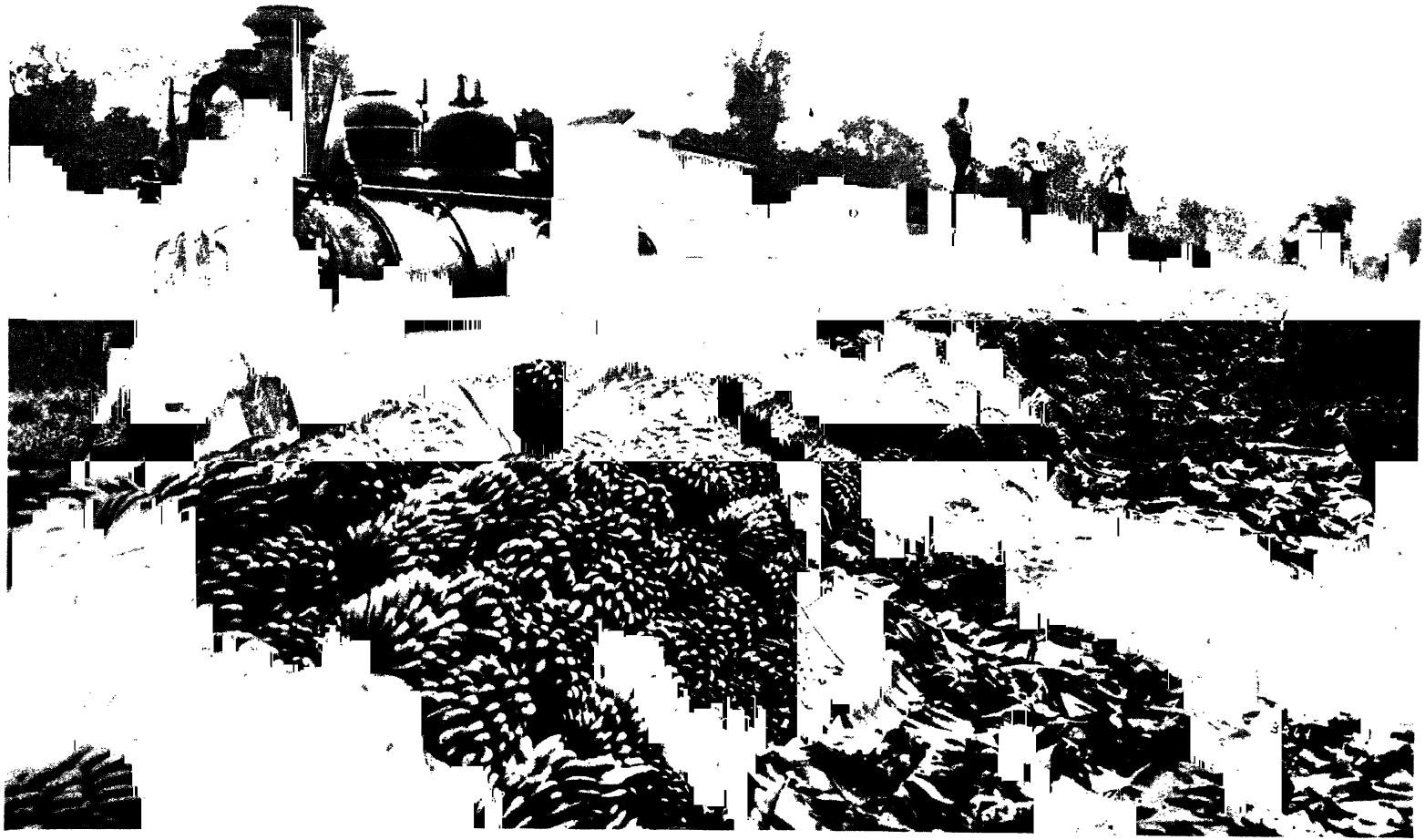
Hawaiian sugar was largely responsible for the building of the Tehuantepec Railroad across Mexico, and it practically keeps the American flag on the Pacific today. The Hawaiian sugar traffic through the Panama Canal takes high rank among the commodities handled.



Photograph by R. W. Perkins

A PINEAPPLE FIELD: OAHU, HAWAII

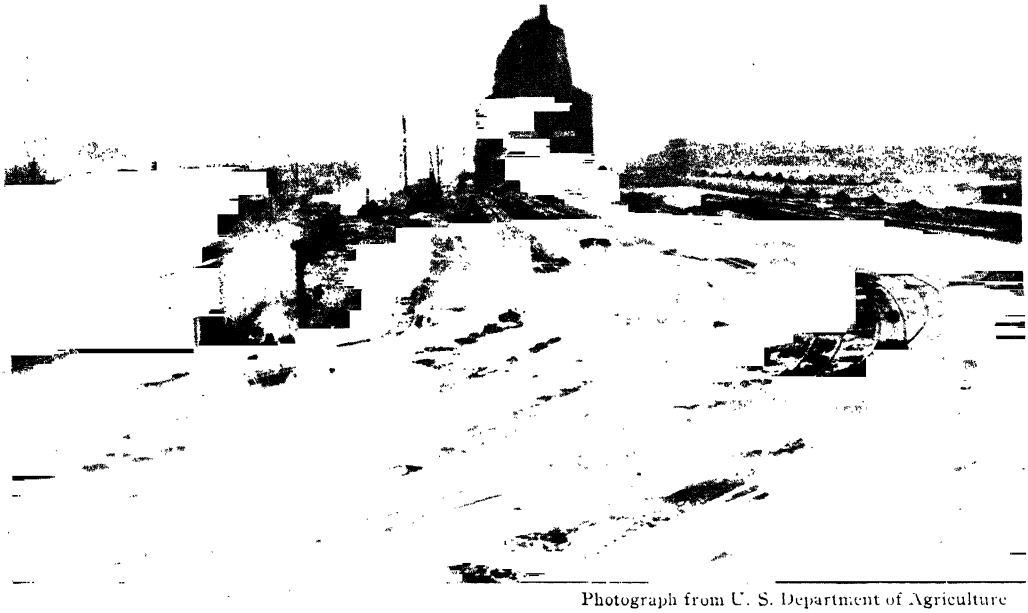
Hawaii has ransacked the tropical world for varieties of pineapples which could be cross-bred for the improvement of the size and flavor of her crop. The result is that Hawaiian canned pineapple has, because of its excellence, found its way into the home of almost every user of this delicious fruit (see page 74).



Photograph from H. N. Rudd

LOADING BANANAS: COSTA RICA

The banana is one of the greatest food producers per acre in the world. We annually import $14,000,000 worth. The banana trade engages more ships flying the American flag than any other business having a foreign end (see pages 7 and 74).



Photograph from U. S. Department of Agriculture

WHERE MILLIONS OF BUSHELS OF AMERICAN CEREALS COME FOR EXPORT: JERSEY CITY TERMINAL OF A GRAIN-CARRYING RAILROAD

of mutton. The Chinese mandarin pays thirty dollars a pound for the birds' nests from which his soup is concocted. In parts of the West Indies the palm worm is stewed in fat, while certain African tribes are as fond of caterpillars as an American is of reed birds on toast. The Turk is as disgusted with the oysters we eat as we are with the fish the Corsican relishes.

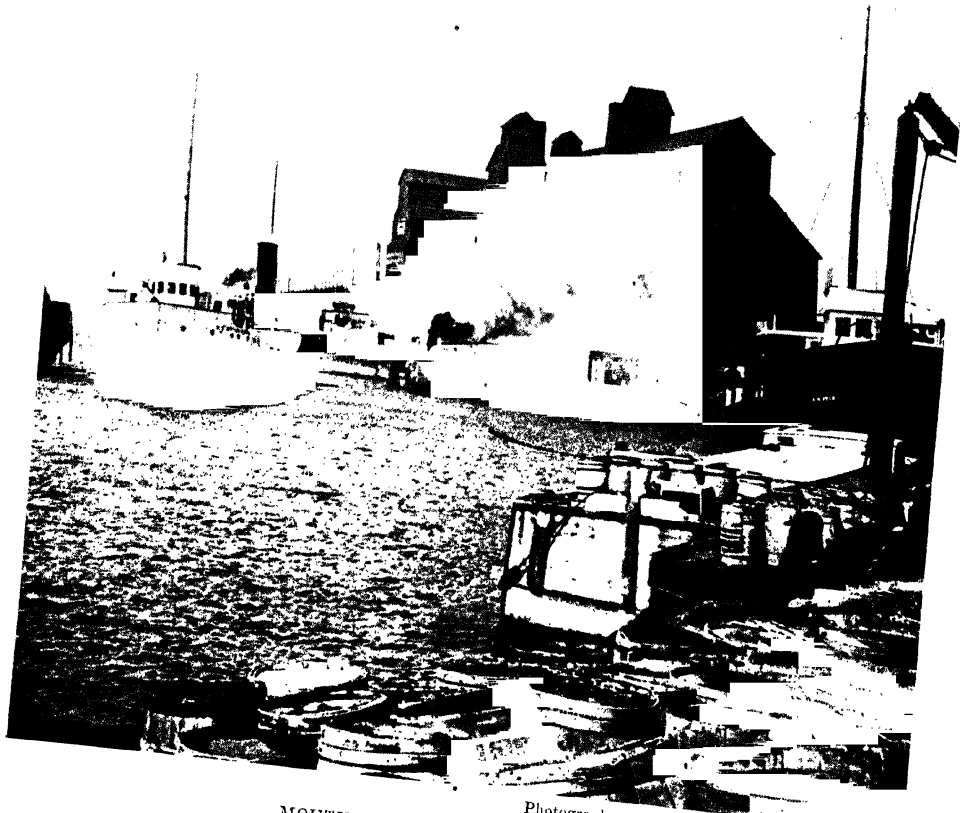
Eating earth, or geophagy, is a common thing in many parts of the world. In some parts of Europe a butter is made of fine clay, and in other regions various kinds of earths are sold in the open market. The Persians use some varieties of soil in making their sweetmeats, while in Mexico the eggs of certain species of flies are used by the Indians in making a food paste which is regarded as a great delicacy (see page 41).

FOOD IMPORTS AND EXPORTS

It is interesting, in view of war conditions in Europe, to study the figures of international trade as applied to the principal foodstuffs moving across the boundaries of the various nations.

According to the Department of Agriculture statistics, Austria-Hungary imported 29,000,000 bushels of corn in 1912, as compared with 8,000,000 bushels in 1911 and 3,000,000 bushels in 1910. Germany's importations of corn during the same years were as follows: 1912, 45,000,000 bushels; 1911, 29,000,000 bushels, and 1910, 23,000,000 bushels. In 1912 Germany and Austria-Hungary had a total importation of 74,000,000 bushels. During the same year Bulgaria and Roumania had a surplus of 75,000,000 bushels.

In 1912 Germany imported 85,000,000 bushels of wheat and flour, being the only one of the Central Powers to import such commodities. She exported 20,000,000 bushels of the same products. Bulgaria had a surplus of 14,500,000 bushels and Austria-Hungary a surplus of 1,000,000 bushels. Their neighbor, Roumania, had a surplus of 57,000,000 bushels that year. If the Central Powers get Roumania's wheat crop, they still have a wheat shortage of more than 12,000,000 bushels. If they do not get it, their shortage is 69,000,000 bushels.



Photograph and copyright by Keystone View Co.

MOUTH OF ERIE CANAL: BUFFALO

"Truly the man who dines well ought to be a deep student of geography, for all races, all nationalities, all types of people, all points of the compass, all latitudes—continent, island, river, and sea—all must come to him as he looks over the bill of fare and tries to find those things that delight his palate" (see text, page 107).

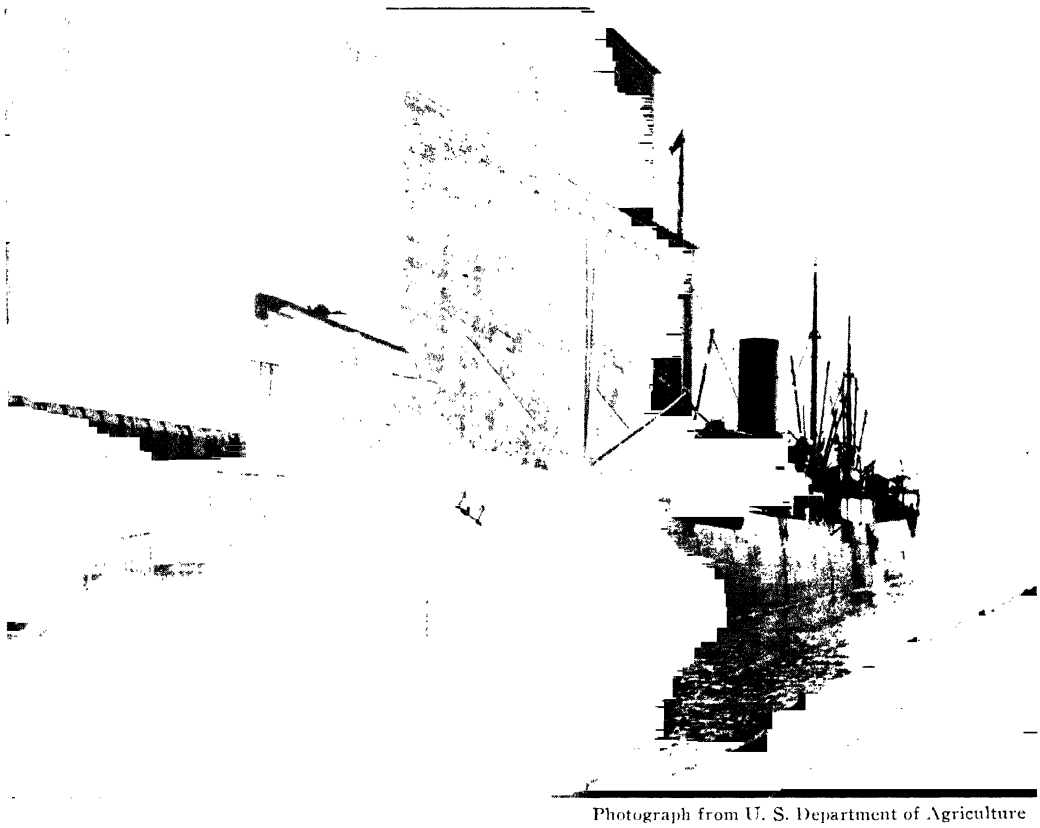
According to the Statesman's Year Book, Germany in 1912 had a surplus of rye, the net exports of that crop being valued at $22,000,000. On the other hand, she imported barley to the value of $100,000,000, corn to the value of $26,000,000, butter worth $40,000,000, and $28,000,000 worth of lard.

WORLD STARVATION AVERTED

The economists of a hundred years ago did not foresee the revolutionizing discoveries that were to come in the century ahead of them. They had no hint that it would go down in history as one of the most momentous of all the ages, from the standpoint of the world's food supply; for three discoveries in the field of food production, any one of which well might stand for a whole millennium of progress, were made by a single generation of men.

When Cyrus McCormick gave to the world the first reaper, he ushered in the age of agricultural machinery, enabling one man to do the work that required five before, and making him able to care for any crop the earth might give him. The world's production will never get too large for the machine-aided farmer to handle.

It was only a little while later that the great chemist Liebig worked out the principles of plant nutrition and introduced



Photograph from U. S. Department of Agriculture

THE "BADENIA" TAKING ON A CARGO OF WHEAT FROM A BALTIMORE ELEVATOR

The long pipes extending from the elevator to the ship carry the wheat by gravity from its bins to the hold of the ship. In unloading, the grain is carried out of the ship by steam-driven endless belts of buckets. In 1913 the United States supplied the outside world with 92,000,000 bushels of wheat, 12,000,000 bushels of flour, 17,000,000 bushels of barley, and other breadstuffs in proportion.

the era of commercial fertilizer. Before his discoveries were made, man had only an empiric control over the productivity of his land. He could only sow the seed and then trust to Providence for his harvest.

And he knew that every harvest saw his land less productive, for each crop drew its draft upon the bank of the soil and cut down the account of fertility just that much. It was a case of always drawing out and never putting in, and even Nature's deposits must ultimately be exhausted under such a procedure. The result was that it began to appear that the agricultural machine would outlive its day, since soil exhaustion appeared inevitable and world hunger an unavertible calamity.

EXHAUSTION OF THE SOIL NEEDLES

But when Liebig discovered that nitrogen, phosphorus, and potash are the only three indispensable articles in the menu of the plant, and that if it is given these it can thrive year after year and generation after generation on the same soil without impoverishing it, he laid the foundation of the new science of soil fertility—a science that permits man, through the use of proper fertilizers, to go on and on in developing and improving his ground.

Who that is a student of farming has not seen a run-down farm on one side of a line fence and a highly productive one on the other. I have known land to have its per-acre production of wheat increased threefold and its production of



Photograph and copyright by Keystone View Co.

A NATIVE BAKER AT WORK: ALEXANDRIA, EGYPT

The Egyptian baker's aim is to get the biggest possible loaf out of the smallest possible amount of flour, with the result that the bread of the Nile Valley is largely a hole wrapped in a crust. The material is rolled out like pie crust and the edges are joined all around. Heat puffs it up into a balloon of bread.

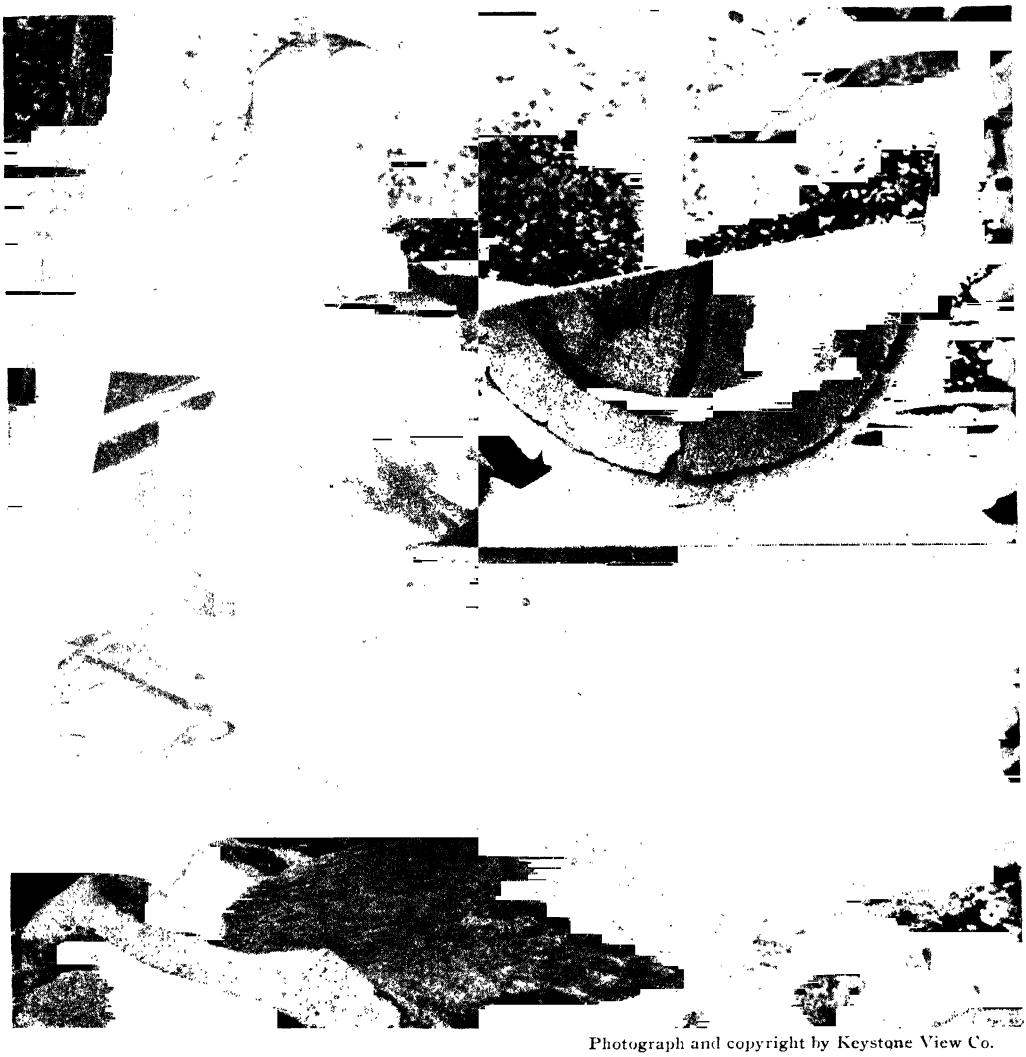
corn fourfold in less than five years, when it passed out of the hands of Peter Tumbledown and into the hands of his prosperous neighbor on the other side of the old line fence. And for a quarter of a century that land has been growing better with every crop rotation. It was the application of Liebig's discoveries that accomplished this result.

What, then, becomes of the argument of that school of thought which says that soil exhaustion is the lesson of all agriculture and all history?

The age of soil fertilization has confirmed to mankind the benefits of the age of agricultural machinery, and will enable the race to transmit them to his children and children's children for generations to come.

SAVING OUR MEAT SUPPLY

If McCormick taught the world how to sow and reap, so that unborn millions of people might have plenty, and if Liebig showed mankind how to insure themselves against the momentous evil of run-



Photograph and copyright by Keystone View Co.

MAKING THE "FLAT BREAD" OF THE NORWEGIAN PEASANT

This Norwegian woman, now past her threescore years, is baking the well-known flat bread under a little shelter of dried branches. The dough for this bread is in the shallow dish in front and to the left of the old lady and is made of coarse barley meal and water. After being rolled thin, it is removed to the round, flat baking-stone in the foreground, under which a fire of fagots is kept burning. It is then stored in a dry place for the winter, when it forms one of the chief foods of the peasants.

down farms, Pasteur signalized that same generation with the lesson of how to save our domestic animals from the ravages of infectious diseases, and through that magnificent discovery gave man a weapon against human as well as animal infections.

In the middle period of the nineteenth century an epidemic of anthrax fever broke out in Europe and ravaged the cattle regions of the Old World. Not only was it one of the most dreaded of diseases because of its great fatality rate, but it is also a most loathsome disease, producing sores and abscesses in its victims, and it attacks animals and men alike.

By the middle of the century sheep and cattle raising in some parts of Europe was practically abandoned; in many places the dairying industry was wiped out, and it seemed that nothing could



Photograph and copyright by Keystone View Co.

ANOTHER VIEW OF THE NORWEGIAN FLAT-BREAD BAKERY

The pile of sheets of bread to the left of the old woman shows that in spite of her old age she is a faithful worker

stop the constantly extending sweep of the malady.

At that time the world did not know that infectious diseases were caused by germs. A little later the science of bacteriology began to develop, and the great French savant Pasteur finally succeeded in demonstrating that anthrax fever is caused by a definite germ. After determining the cause of the disease, he undertook to work out the problem of combatting it.

He found that the germ of anthrax fever, when cultivated in chicken broth for several generations, loses its ability to produce the disease. Not only this—he proved that when this bacillus loses its ability to produce disease, it gains a new quality, that of rendering animals immune from the attacks of uncultivated bacilli. With these facts in hand he announced that he could render sheep and cattle immune against anthrax by inoculation.

ONE OF THE MOST DRAMATIC SPECTACLES OF HISTORY

When he made this announcement he was greeted by a storm of derision on



Photograph by A. H. Blackiston

MAKING TORTILLAS: MEXICO

The tortilla is a sort of flapjack rolled out on a primitive "dough board" of stone, with a rolling-pin which Nature manufactured by centuries of water-attrition. The oil-can in the foreground is the water bucket of the peons of Mexico.



Photograph by Henry Ruschin

A GERMAN ARMY FIELD BAKERY

the part of the uninformed and by a wave of skepticism at the hands of the scientific world. The president of an agricultural society offered to furnish him a drove of 50 sheep, half of which were first to be inoculated with the cultivated virus, and later the whole flock was to be inoculated with the uncultivated variety. They were then to be kept together in one pen under precisely the same conditions. If the vaccinated sheep remained healthy and the unvaccinated ones died of anthrax, it was to be accepted that Pasteur had proved his case.

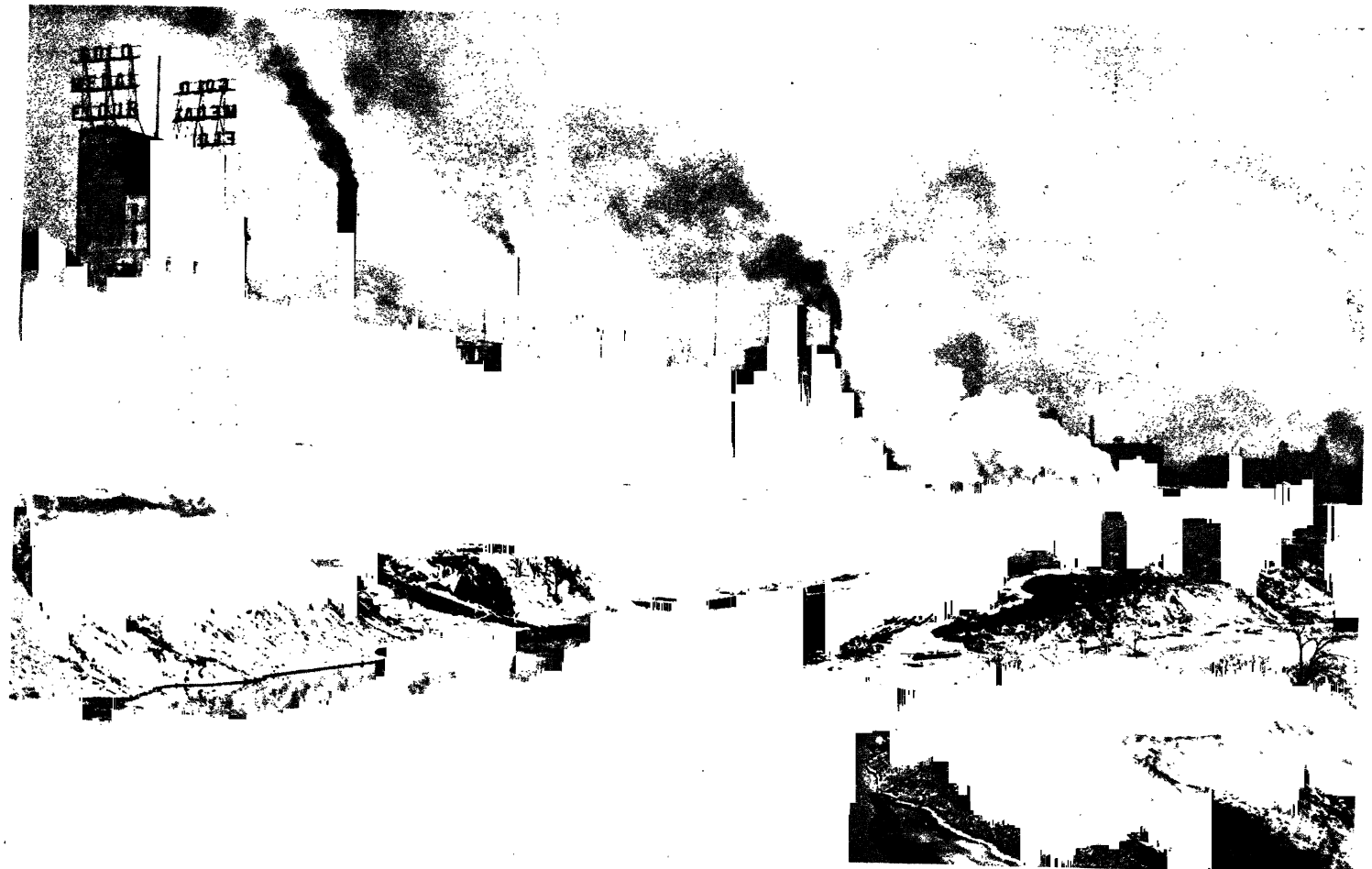
The challenge was accepted, two goats being substituted for two of the sheep, and ten cattle being added. On May 5, 1881, the preventive inoculation of half of the sheep was undertaken, and was repeated on May 17. On May 31 all sixty of the animals were inoculated with uncultivated germs.

Two days later a vast crowd, composed of veterinary surgeons, newspaper correspondents, farmers, and scientific men, gathered to witness the closing scene of this remarkable test. And they saw one of the most dramatic spectacles in the history of peaceful science. Every animal that had not been vaccinated with the anthrax-preventing virus was either dead, dying, or in the last stages of the disease, while not a single one of those which had been vaccinated had contracted the malady. In the course of a few hours every infected animal in the compound was dead, while every one that had been vaccinated was in perfect health.

This discovery soon released Europe from the thraldom of the epidemic of anthrax, and it laid the foundation for preventive medicine as applied to domestic animals so firmly as to insure mankind against the conquest of his animal food supply by the microscopic creatures that cause such epidemics as anthrax, cholera, and the foot-and-mouth disease.

TEACHING PEOPLE HOW TO FARM

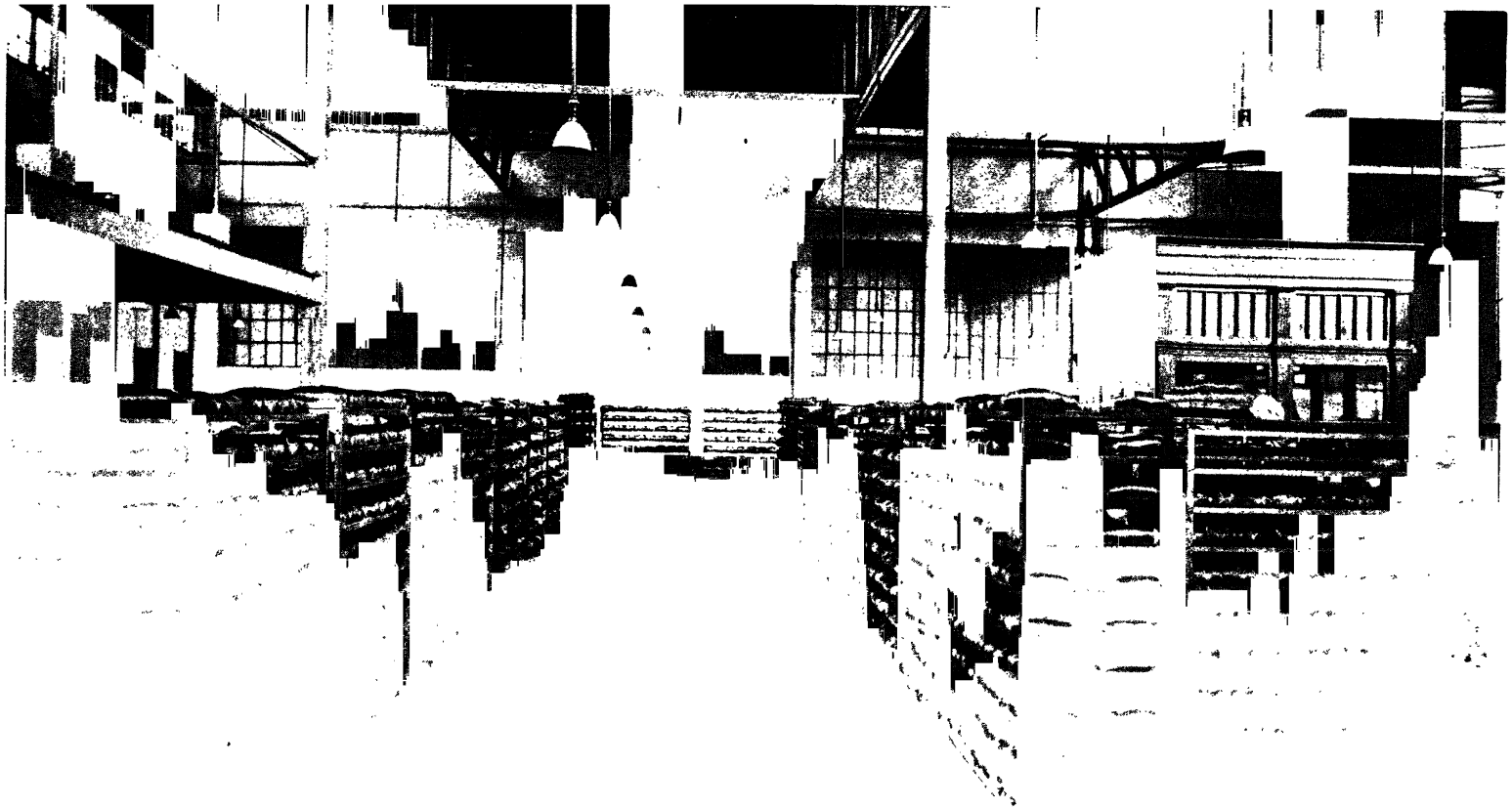
The great need of the world in the future is not so much more acreage to cultivate as a better handling of the acreage already under cultivation. While it is estimated that the total area now actually used in growing crops amounts to



Photograph from the Washburn-Crosby Company

THE MINNEAPOLIS MILLING DISTRICT AS SEEN FROM THE MISSISSIPPI RIVER

This is the center of the flour-producing district of America. A single plant has a capacity of 40,000 barrels of flour a day. It uses 150 carloads of wheat daily and turns out flour enough to furnish 9,000,000 people with their daily bread. From incoming wheat to outgoing flour there are twenty-three processes.



THE BREAD RACKS OF A MODERN BAKERY IN THE NATION'S CAPITAL

Photograph from Corby Bros.

There are 24,000 bakeries in the United States, employing 100,000 people and producing $400,000,000 worth of bread, crackers, pies, and cakes a year. These figures do not include those which do a business of less than $500 a year nor hotels. Our bakery products are worth as much as those of our creameries and vegetable canneries together.



Photograph by Harris & Ewing

SECRETARY OF AGRICULTURE HOUSTON PRESENTING WALTER LEE DUNSON A DIPLOMA AS THE CHAMPION BOY CORN GROWER OF THE UNITED STATES

only about 15 per cent of the total landed area of the world, it has been demonstrated that with scientific agriculture this area itself might suffice to feed a population vastly greater than that now living.

With all of her teeming millions, only 18 per cent of Asia's land, 12 per cent of that of the Americas and Africa, 27 per cent of that of Europe, and 5 per cent of that of Australia have ever felt the touch of the plow. Without encroaching at all upon the world's forests, but using only the steppes, pampas, savannas, and prairie lands, there might be added to the earth's farming lands an area twice as great as that now under active agricultural operations.

The United States has been working along lines looking more to the extension of scientific methods to the present cultivated acreage, than to the extension of farm operations to new acreage. The bulk of the $30,000,000 it now spends annually, through its Department of Agriculture, is for the improvement of farming methods. In latter years a program for the taking of the gospel of good farming to the farmer himself, and demonstrating it in practice, instead of writing it down upon paper, has been productive of very wonderful results.

In the club work of the last fiscal year hundreds of county agents of the Department of Agriculture, working in thirty-three States, went out upon the farm and showed the farmers themselves how to increase their yields. The thousands of farmers who accepted the offer to farm under the direction of the Department of Agriculture increased their yield of corn nine bushels per acre, their wheat seven bushels per acre, and their oats ten bushels per acre.



Photograph from U. S. Department of Agriculture

JERRY MOORE, OF FLORENCE COUNTY, SOUTH CAROLINA

Jerry is a twentieth century farmer. South Carolina soil returned him 228¾ bushels of corn to the acre.

TEACHING THE YOUNG IDEA HOW TO "SHOOT" GOOD CROPS

But probably more significant even than the work among the farmers themselves, has been the work among the boys and girls. Sixty thousand boys and fifty thousand girls were enrolled in club work in the Southern States last year. Many of the boys were organized into clubs to raise pigs and poultry, others into clubs for demonstrating the advantage of four-crop rotation in southern farming, and still others into clubs for the growing of winter legumes for soil improvement. Girls were taught to make house gardens and to preserve for home use the garden products as well as the waste fruits and vegetables of the entire farm.

In the north and northwestern States 150,000 boys and girls were enrolled, the leading club projects being the growing of corn and potatoes and garden and canning work.

The success that has followed these activities has been wonderful, demonstrating to the farmers that their children can accomplish marvels of which they never dreamed. Ten girls in Mississippi produced 27,850 pounds of tomatoes on ten one-tenth-of-an-acre plots. They were working as a team for a prize given by Kentucky business men. The value of their tomatoes was $1,179, and the profits on their joint plots—together only one acre in extent—amounted to $868.

Ten boys in Alabama averaged 171 bushels of corn to the acre. The people in their several communities no longer have a contempt for the farming experts of the Department of Agriculture. Heretofore they have always urged that with the money of Uncle Sam to spend it was but natural that large yields could be gotten, but that the average farmer could not afford to duplicate these methods. The boys and girls who have taken part in these contests have given such an effective answer to these contentions that even the inertia of the indifferent farmer has been overcome. Many other kinds of club work is being done.



Photograph from U. S. Department of Agriculture

CLUB MEMBERS SELECTING THEIR SEED IN THE FIELD BEFORE FROST

The farmer who sees that every grain he puts into the ground is one able to produce a hardy sprout lays the foundation for a big crop

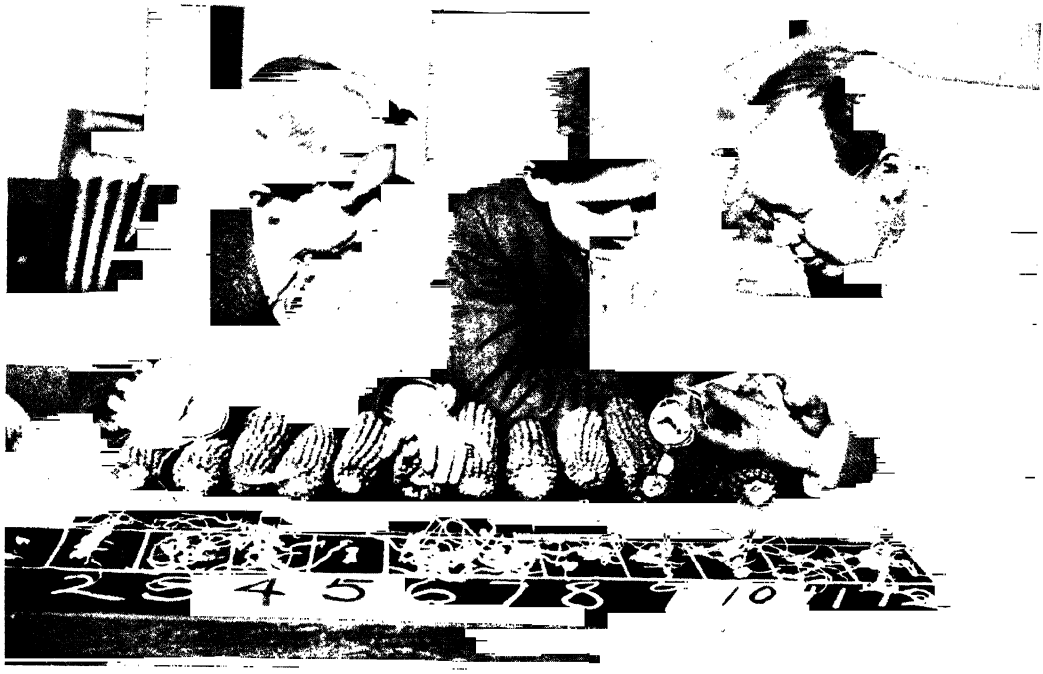
In Oregon a packing-house distributed a carload of brood sows among the children of the Hood River region of that State and of Washington. They were sold on credit to these boys and girls, who agreed to raise them according to the Department of Agriculture specifications.

The buyers were charged 6 per cent interest on the purchase price, to be paid out of the profits from the pigs raised. The school officials of the Hood River region have charge of the experiments, and those boys and girls doing the best work and making the best reports are to be awarded scholarships to the State University, and other prizes.

THE STORY OF A LOAN

A farmer in Macon, Georgia, who carries a large bank account, went to his bank with his twelve-year-old son and endorsed the latter's note for ten dollars. The cashier inquired of him why he was having his boy borrow ten dollars when he himself had so much money in the bank. The farmer replied that his son was going to enter a boys' pig club, and that he wanted him to acquire a banking experience as he went along. He said that it was worth ten dollars to him to see how his boy handled the loan.

An Alabama philanthropist hit upon another idea for increasing pig-raising in his community. He bought twenty pigs and sold them to as many boys, the bargain being that when the boys brought him two pigs to take the place of the one thus sold, the debt should be considered discharged. The philanthropist then took these two pigs and gave them to two



Photograph from U. S. Department of Agriculture

EXPLAINING THE RAG-BABY TEST IN THE GERMINATION OF SEED CORN

Six grains of corn are taken from each ear and wrapped in rags, which are then moistened and set away for germination. After the grains have had time to sprout, the rags are opened and the seeds examined. Some ears yield no sprouting grains; others yield grains that sprout weakly; still others yield grains with a "batting average of 1,000 per cent." These are the ones which produce good corn crops.



Photograph by Frank H. Bothell

CHILDREN BRINGING SAMPLES OF MILK TO BE TESTED FOR BUTTERFAT: BOUNTIFUL, UTAH



Photograph from U. S. Department of Agriculture

POLKTON POULTRY CLUB: ANSON COUNTY, NORTH CAROLINA

"If the rural housewife will not come to the school of domestic science, we will take that school to her." Such is the latest idea in agricultural extension work. Under the new Smith-Lever Law, the U. S. Department of Agriculture will, besides organizing dairying, poultry, textile, and food study clubs, giving lectures, and conducting correspondence courses, send its agents directly into the homes and show the housewives how to make all sorts of labor-saving devices, from a fireless cooker costing twenty-five cents to a roller table to carry the family meal from the kitchen stove to the dinner table (see text, page 101).

other boys under similar terms. In this way he has planned an endless chain of pigs and an ever-increasing circle of boy club members.

It seems certain that the wonderful results achieved through the boys' and girls' clubs in the United States will eventually lead to their adoption by every progressive government. Probably no other work can be as influential in promoting the world-wide adoption of modern methods of farming as the work among the children.

That habit of mind of the grown-up which makes a man ashamed to be outdone by a child, serves to stimulate the adult farmer when the children of his community are engaged in club work. The enthusiasm of youth is thus capitalized, and the nearly 300,000 boys and girls who are now engaged in this work in America will form a future army of food producers, who will not only be good farmers and farmers' wives, but who will inspire hundreds of thousands of others to profit by their examples.

ALL ROADS LEAD TO THE DINNER TABLE

Could we, like the great French writer, Maupassant, turn lose our fancy as we dine, we could see a great army of men and women working that we might eat. The appetites of men now levy tribute upon all the continents and all the seas,



Photograph from U. S. Department of Agriculture

EARL HOPPING AND HIS GOAT

If every American farmer raised as much corn to the acre as this Arkansas boy, with a one-goat team, the United States alone would grow as much corn as the whole world produces, with a billion bushels to spare (see text, page 29).

and where once all roads led to Rome, now they come directly to our dinner tables.

Let us sit down to dinner and go over the menu and try to list those who have assisted in the preparation of our meal.

At the top of the list come olives and salted nuts. The olives mayhap are from Spain, the almonds from California, and the pecans from Texas. The salt on the nuts was prepared in New York State. Also we have celery that came from Michigan.

Then comes the soup. Without a cookbook at hand, this writer will not pose as an authority on the ingredients of soup, but it may be Chesapeake Bay clam chowder, which certainly has some pepper from Africa in it and other ingredients from far and wide.

Our fish is salmon from Alaska, and our prime ribs of beef came to our table through the Kansas City "packing-town." Our potatoes came from Maine, our boiled rice from China, our string beans from Florida, and our tomatoes from Maryland.

Next comes our salad, and it contains—if a man may guess at the contents of salads and dressings—Mexican peppers, Hawaiian pineapple, Sicilian cherries, Pennsylvania lettuce, Iowa eggs, Spanish olive oil, Ohio vinegar, California mustard, and Guiana red pepper.

When we get down to the ice-cream, we eat Virginia cream, Cuban sugar, Ecuadorean vanilla, and Mexican chocolate. The cake that goes with it is made of butter from Illinois, flour from Minneapolis, made from wheat grown in North Dakota; baking powder from Pennsylvania, and other ingredients.

When it comes to coffee, if we are fastidious we will have issued a draft on both Turkish Arabia and Dutch Java, or if we are only folk of every-day taste we



Photograph from U. S. Department of Agriculture

A CHAMPION UTAH GARDENER CONVERTING HER POTATOES INTO STARCH

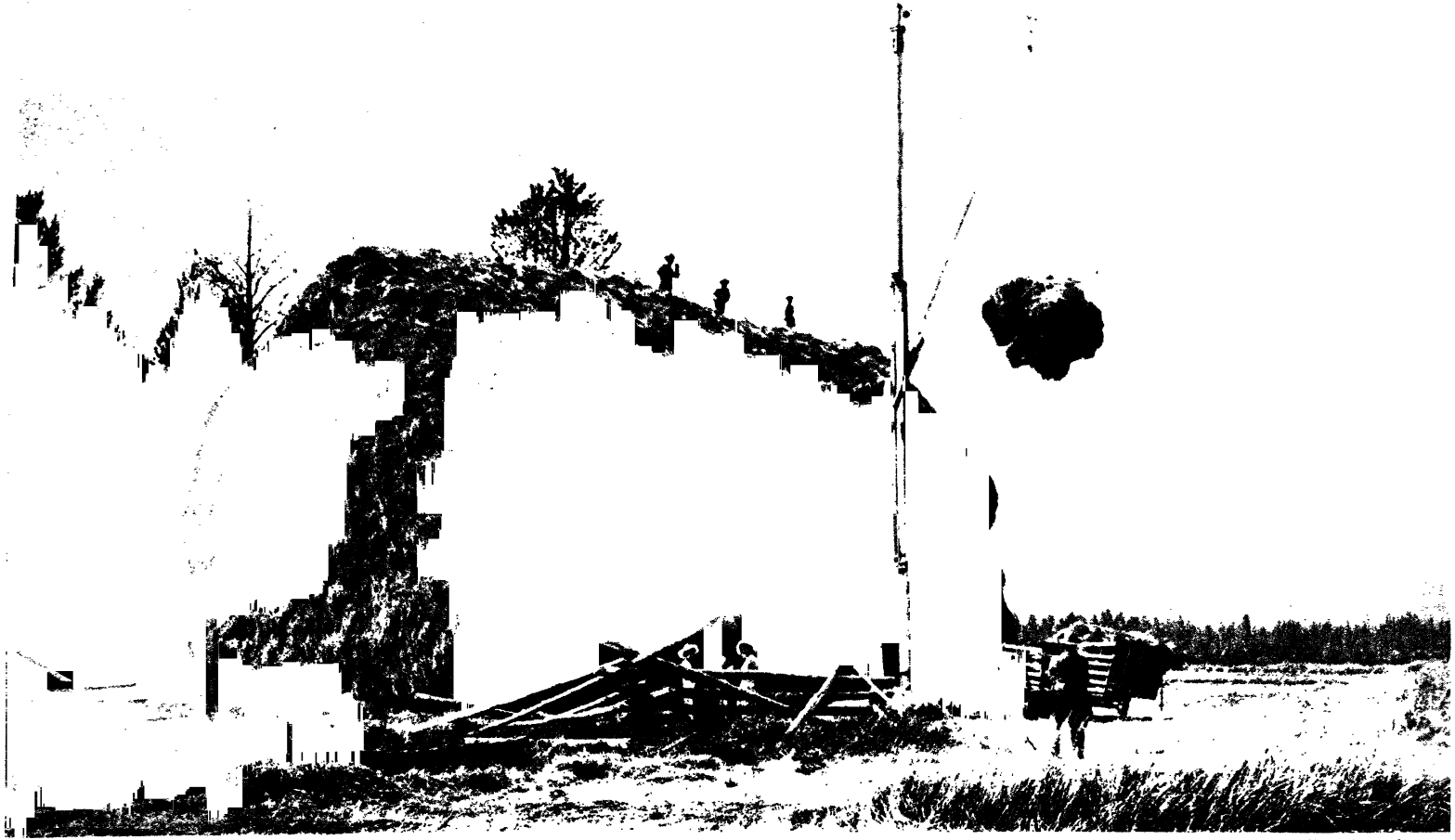
The total value of the product of boys' and girls' clubs and those for women in Utah for 1915 amounted to $63,843, secured at a cost of $3,358 for the extension work. It is the ultimate purpose of the United States Department of Agriculture to spend $5,000,000 a year in teaching the farmers' wives and daughters the art of home economics.



Photograph by Frank H. Bothell

BOY CLUB MEMBERS LEARN HOW TO MAKE BIG PORKERS OUT OF LITTLE PIGS

An Alabama philanthropist has applied the endless-chain idea to pigs. He bought twenty little sows and sold them to as many boys. Each boy undertook to raise his pig and to give the philanthropist two little ones from the first litter farrowed as payment. These in turn are to be delivered to other boys on the same terms, the philanthropist assuming all risks (see text, page 102).



Photograph by Miller Photo Co.

STACKING HAY BY HORSE-POWER

The United States devotes 72,000,000 acres of land to hay and other forage crops. Were this used to grow potatoes, even at our presen rate of production, it would yield 6,480,000,000 bushels, which is more than the whole earth produces today. The passing of the horse will releas this area to human food production.



A MEXICAN OUTDOOR BAKERY

Although the tortilla reigns in Mexico, revolution or no revolution, bread baked in outdoor ovens is its principal rival for popular favor. The oven is first heated by a roaring fire. After it is thoroughly hot, the fire is withdrawn, and the unbaked dough put in its place. The heat of the brick bakes the bread.



Photograph by Frank H. Bothell

RUTH BYBEE'S EXHIBIT AT THE STATE FAIR, UTAH

This little girl made every article in the exhibit and dressed the doll for good measure. Her Battenburg lace, her hand-painted china, no less than her jellies, jams, and pickles, show how good training may make a girl independent (see text, page 101).

will content ourselves with the Brazilian product.

THE WORLD OUR SERVANT

And so, when we come to reckon up those who have helped produce the raw materials of which our foods are made, we find the clouted African savage and the American stock grower; the South American Indian and the California truck farmer; the Javanese coffee picker and the Virginia dairyman; the turbaned Arabian and the New York orchardist; the Chinese coolie and the Dakota wheat farmer; the Mexican peon and the Chesapeake Bay fisherman; the Porto Rican planter and the Hawaiian sugar grower; the Spanish olive packer and the Alaskan Eskimo fisherman.

Yet all these neglect the matter of transportation. Our food comes to us on the heads of Indians, on the backs of donkeys, drawn in carts by huge water buffaloes, aboard the "ship of the desert," on wheelbarrows propelled by Chinese coolies. Steamships, railroad trains, auto trucks, and delivery cars have all played their part in the great work of catering to discriminating appetites.

Truly the man who dines well ought to be a deep student of geography, for all races, all nationalities, all types of people, all points of the compass, all latitudes—continent, island, river, and sea—all must come to him as he looks over the bill of fare and tries to find those things that delight his palate.



THE SOUTH FRONT OF THE WHITE HOUSE

One of the Unusual Pictures in the Wealth of Color and Half-tone Illustration
Which Fill the Pages of "Washington—The Nation's Capital"

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VOL. XXIX, NO. 3 WASHINGTON MARCH, 1916

THE NATIONAL GEOGRAPHIC MAGAZINE

GREAT BRITAIN'S BREAD UPON THE WATERS: CANADA AND HER OTHER DAUGHTERS*

BY WILLIAM HOWARD TAFT

THE strain of the great war now raging is a test of the character of the peoples engaging in it, and of the institutions to which they have committed themselves and in behalf of which for decades and centuries they have labored. It places their ideas of government and their philosophies of the life in a crucible under the intensest heat. It is no respecter of preconceived theories, and it lays bare weaknesses that were not suspected. The war has shown a high spirit of patriotism and self-sacrifice as the common trait of all those engaged in it.

In England the war has betrayed the delays and blunders in the beginning of a war which it seems impossible to avoid in a parliamentary government.

England's course in this war has confirmed the view that if war is to be a normal condition of national and international life, popular government, with a free press and unrestrained public opinion, is not the best form adapted to act quickly and to overwhelm an enemy.

Its inherent disadvantage in the outset of a war is not only a reason why it should avoid war when it can do so with honor and without national sacrifice, but it is also a reason why it should in time of peace make every reasonable preparation for national defense consistent with individual liberty and the control of the people.

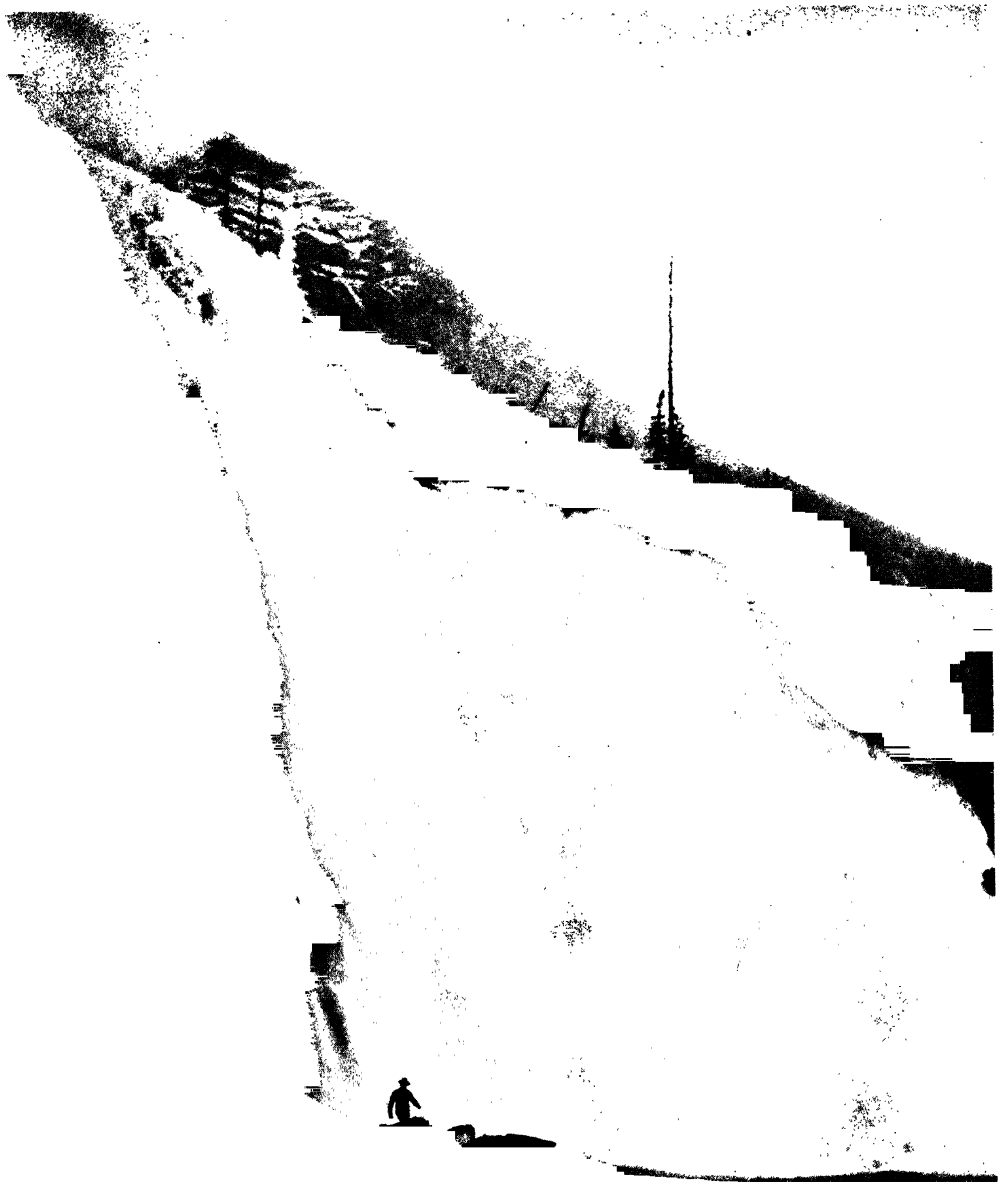
It is not true that popular government unfits a people for war, saps their unselfish patriotism, or dulls their willingness to make the sacrifice. The armies of France raised in the wars of the French Revolution refute any such notion. Our own Civil War shows that participation in government and the consequent sense of ownership in it prompt the highest spirit of sacrifice for the country.

Many counsels in a democracy may confuse or may prevent the needed concentration of power in one competent leader or body of leaders to produce wise and quick action, but the fault is not in the willingness or capacity of the citizens to make good soldiers. Training in popular government and traditional love of civil liberty stir the souls of men to costly conflict, even when their material interests and their opportunities for evading its sacrifices tempt them to withhold their aid.

THE LESSON WHICH THE AMERICAN REVOLUTION TAUGHT GREAT BRITAIN HAS BEEN WORTH ALL IT COST HER

We find such an instance in the conduct of the people of Canada, Australia, and South Africa, under the wise and generous treatment of them by Great Britain, their mother country, for half a century. It is a pleasure for a student of popular constitutional government to

*An address to the National Geographic Society, February 11, 1916



THE EMPEROR FALLS

What more inspiring sight than after hours of climbing over precipitous mountain trails and hearing the roar of falling waters in the distance to come suddenly into view of a waterfall like this? The little Grand Forks River, which pursues its tortuous way through the wild Mount Robson region of British Columbia, is a series of scenic surprises, not the least of which is this beautiful fall.

dwell upon this and trace out the reason for it.

It is possible for us, who are not involved in this war and who occupy a neutral position, to do justice to the noteworthy exhibition of admirable qualities in all the belligerents without exposing ourselves to the charge of partisanship or prejudiced sympathy; and it is with that attitude and from that standpoint that I invite your attention to the consideration of the vindication of England's policy in the autonomous governments under her, which constitute a part of her so-called empire.

Through the blindness of George III, and against the judgment of the more liberal statesmen of his reign, the American colonies were lost to England. That they had originally, all of them, a warm affection for the mother country and a pride in their relations to her is clear; that the course which George III and his ministers took in dealing with them was ill-advised and unjust and altogether lacking in prudence and tact, the modern English historians are now the first to admit; that the grievances of which the colonies complained were perhaps not as acute and oppressive as we have been taught in our school histories to believe may be true.

It suffices to say that, however weighty or otherwise those grievances were, they were at least enough to instil in the minds of a people who had enjoyed practice in self-government, through neglect of the mother country for 100 years, a vision of independence and a desire for it that, once developed, precluded the possibility of a resumption of British control. The lesson which the war of the American Revolution taught to Great Britain has been worth all it cost her.

OLD GRIEVANCES ARE NOT FORGOTTEN

The spirit of revenge in which we dealt with the Tories who were loyal to England in our struggle, and the confiscation and the suffering to which we subjected them, drove a body of people into Nova Scotia and into Upper Canada numbering 40,000. England sought by the appropriation of 3,000,000 pounds to salve the wounds of these United Empire loyalists. Their feeling of enmity toward the United States, handed down by tradition, has had a real effect to prevent the union of Canada with this country. Their attitude was confirmed in the War of 1812.

Under the Constitution of 1791, which divided Canada into two provinces, Upper and Lower, each had a legislature with a council which the legislature did not control, under a British governor. This system lasted for 50 years, but it proved unsatisfactory. A "family compact" of ultra Tories in the council ruled Upper Canada and defied and bullied the legislature.

In Lower Canada, where the French lived, England had, by the Quebec Act of 1774, satisfied their race and religious sentiment by assuring to them a continuance of their civil law and customs and the maintenance of the quasi-political status of their church. This prevented the French from joining the American Revolution and retained Canada for England.

A BRILLIANT STATESMAN

The promise has been faithfully kept. Still the constitutional act did not work well with the French any more than with the English. So it was that in 1837 the Frenchman Papineau in Lower Canada and the Scotchman MacKenzie in Upper Canada sought to overthrow their respective governments by force. These rebellions were easily overcome, but there remained for the home government the burdensome task of solving what seemed an insoluble problem of restoring peace and order among a dissatisfied people, half English and half French.

Lord Melbourne and his associates prevailed on the Earl of Durham to undertake the task. The selection was fortunate for Canada and fortunate for Great Britain, although the immediate result of his short incumbency was apparently a humiliating failure. Lord Durham was one of the great statesmen and the great radical reformer of his day.

He entered Parliament at 21, and long before they really became the burning issues he was advocating Catholic emancipation, a reform of representation in Parliament, extension of the franchise, and a repeal of the corn tax.



Photograph by Gilbert H. Grosvenor

A FAMILY OF NINE SONS: BADDECK, CAPE BRETON, NOVA SCOTIA

This family will soon be able to have a baseball team all its own. From Cape Breton Island have come many of the most loyal naturalized citizens of the United States. To our merchant marine on the Great Lakes this little island has probably contributed more captains and first

He was the son-in-law of the great Earl Grey and was the real draftsman of the great reform laws of 1832. He was hot-tempered, vain, impatient of criticism, and entirely unrestrained in the expression of his real opinions and in that diplomacy which would have given him far greater influence in the politics of his day. He was regarded by the people of England as their friend and representative, when the people were not as powerful as they are now. He was excluded from ministries because it was thought that no ministry could get along with him, however much their policies agreed in general outline with his.

When Lord Melbourne and Lord John Russell asked the Earl of Durham to go to Canada he was most reluctant to do so; but the ministry, Lord Melbourne, and others pledged themselves to back him in every way and gave him almost unlimited power to deal with the situation. When he reached there, he found it impossible to convict the rebels among Papineau's followers before a French jury, and finally they were induced to admit their guilt. He pardoned all but Papineau and a dozen others, against whom he entered a decree of exile to the Bermudas, with a penalty of death if they returned.

This disposition of the cases was well received in Canada and was approved in private letters of Melbourne and the other ministers. Lord Brougham, however, who was then in the House of Lords and the bitter enemy of Durham, contended that this was contrary to the British constitution and wholly beyond Durham's authority. He was supported by Lord Ellenborough. The ministry ignominiously deserted Durham, repudiated his action, and acquiesced in Brougham's demands. Durham at once resigned and returned to England after five months' service. The government studiously refused to give him the ordinary courtesies that a returning governor general was in the habit of receiving. His figure was a pathetic one. He was but 48 years of age, with an ability second to none in England; but his life seemed a complete failure and within two years he died—a broken-hearted man.

A REMARKABLE STATE PAPER

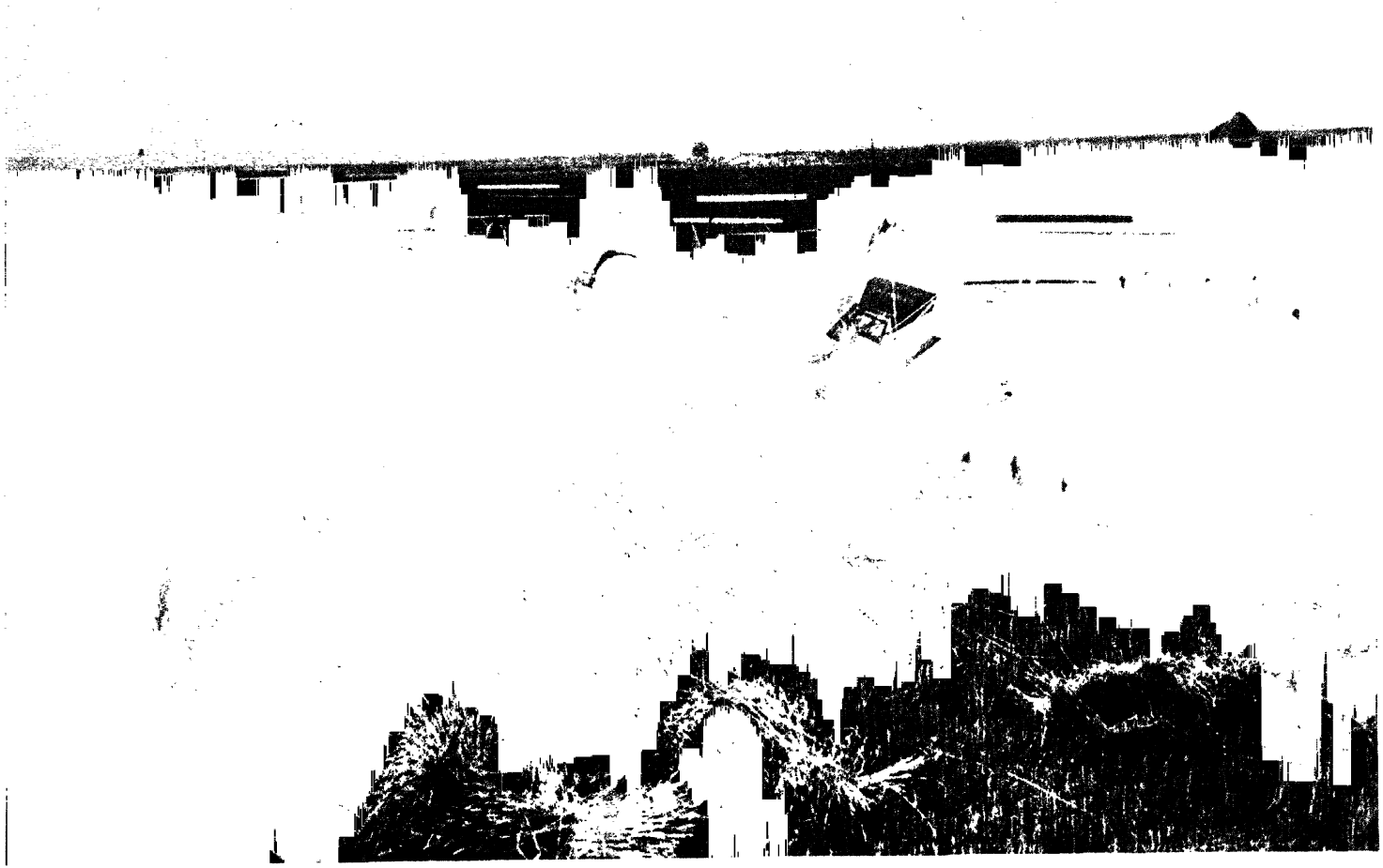
During his five months, however, he had seen clearly into the difficulties of Canadian government, and left a report which has been pronounced by high authority to be one of the greatest state papers in British history, and which really has been the basis of the highly successful policy pursued by Great Britain since in dealing with those peoples who have remained a part of her so-called empire, but who have inherited, because of their Anglo-Saxon origin, their love of popular government and of individual liberty.

He recommended that the Upper and Lower Canadas be governed by a single Parliament and with local self-government for each province, and he foreshadowed the union of all of the British provinces in North America. He urged the adoption of responsible government—that is, the executive control by the leaders of the majority in the legislature. He said: "The Crown must submit to necessary consequences of representative institutions, and if it has to carry on the government in union with a representative body, it must consent to carry it on by means of those in whom that representative body has confidence."

He said: "The constitution of the government, the regulation of foreign relations and of trade with the mother country and the other British colonies and foreign nations, and the disposal of the public lands are the only points on which the mother country requires control."

Local municipal government, in Durham's view, bore an important relationship to general government. He had noted the absence of adequate municipal institutions in Lower Canada. He said: "A general legislature which manages the private business of every parish, in addition to the common business of the country, wields a power which no single body, however popular in its constitution, ought to have—a power which must be destructive of any constitutional balance."

He thought that by establishing an adequate system of local government the general government would be relieved of those matters which are not its proper



REAPING WHEAT ON THE PLAINS OF ALBERTA, CANADA: THESE GREAT PLAINS ARE A CONTINUATION OF OUR OWN ROLLING PRAIRIES

marked ability and with very considerable success; but the growth of Canada was not responsive to the hopes of her people or of England, and it was conceived that a change was necessary looking to a closer union of all the British colonies of North America, including Nova Scotia, New Brunswick, and Prince Edward Island, as Durham had advised and foreseen.

One of the two parties adopted a platform of federation in 1858, but it took nearly ten years to carry the proposal to a successful issue. A convention for this purpose met at Quebec in 1864, consisting of 33 delegates. The convention sat for 18 days behind closed doors and left no official record of its deliberations.

The members had clearly in mind the Constitution of the United States and the history of that Constitution as a field in which they might find guides for their conduct. They represented both political parties, but in their deliberations they subordinated temporary political advantage to the patriotic purpose of reaching an agreement upon a government that should give opportunity for great national growth and development.



WINTER BATHING: BANFF, ALBERTA

Water sports under such conditions would suggest that all the comforts of home were conspicuous by their absence. However, the sulphur springs for which Banff is famous maintain a uniform temperature of 110 degrees throughout the year. Therefore, while the atmospheric temperature may approximate zero, the water is very warm and pleasant for the bather—who keeps below the surface!

The secret deliberations in such a crisis, as in our Constitutional Convention, led to the expression by the delegates of their real convictions; shortened the debates, because they did not talk for buncombe, and brought in the short space of less than three weeks a solution of what had seemed a very difficult problem.

The men who most contributed to this end were John A. McDonald, George Etienne Cartier, and George Brown. While Cartier and McDonald had been together as political associates, they represented different elements, Cartier being a representative of the French Canadians and McDonald a representative of the English and Scotch conservatives, while Brown represented the liberal English and Scotch voters.

The success in its way was as notable as that of our own Constitution, in the wise compromises that were effected and in the sacrifices of personal opinions and notions that the compromises necessitated.

The successful launching of the new government proposed was attended with difficulties. The smaller provinces of



Photograph by Gilbert H. Grosvenor

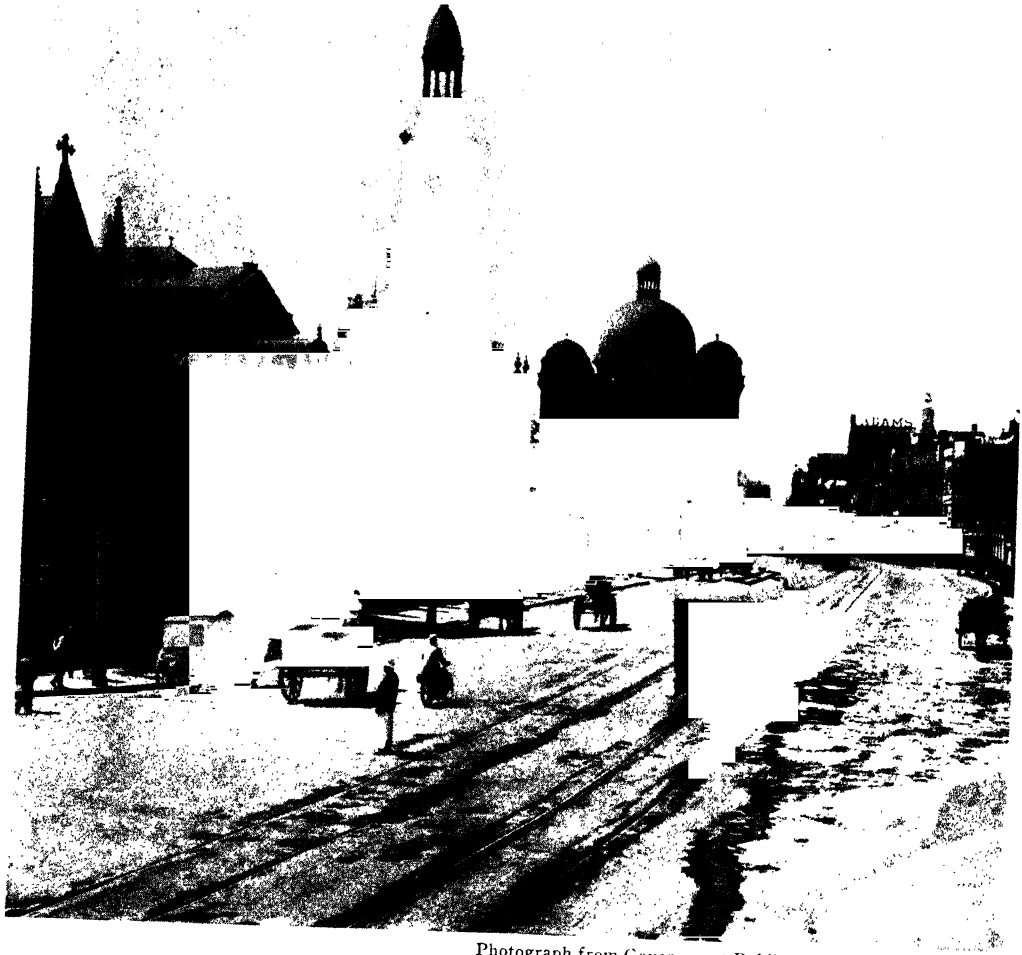
VIEW OF THE BRAS D'OR LAKES, NEAR BADDECK, CAPE BRETON



Photograph from Lieut. W. K. Harris

TIMBER FROM THE SLOPES OF MOUNT WARNING: NORTH COAST DISTRICT, NEW SOUTH WALES

Conservation of forest resources is a problem which has long confronted the governments of the various Australian States, for the early settlement of the more heavily timbered regions was characterized by a waste of much valuable timber. This problem has been well solved, however, by establishing numerous State forests, administered in very much the same way as our own national forests.



Photograph from Government Publicity Department, Sydney

GEORGE STREET, SYDNEY, NEW SOUTH WALES, SHOWING TOWN HALL

Sydney, the metropolis of New South Wales and likewise its capital, is an English city, although on every hand there may be seen American goods advertised for sale. This city, the oldest in Australia, was founded by Capt. Arthur Phillip in 1788 and is the continent's principal naval station. The deep water of its beautiful and nearly landlocked harbor is almost without shallows up to the edge of its rocky shores. With the possible exception of Melbourne, Sydney is the most important commercially of any of the British ports of the South seas. The city is in a particularly picturesque spot and notable for the many handsome public buildings, parks, and gardens, which, together with its wide, clean streets, give it the appearance of one of the more attractive European capitals.

Nova Scotia and New Brunswick were loath to accept the government proposed and were only brought in by an agreement that a railroad should be built connecting Halifax with Quebec. It is an interesting and somewhat singular fact that the later union of the far western provinces with the Dominion was also conditioned upon the establishment of communication by railway between Ontario and Quebec and the Pacific coast.

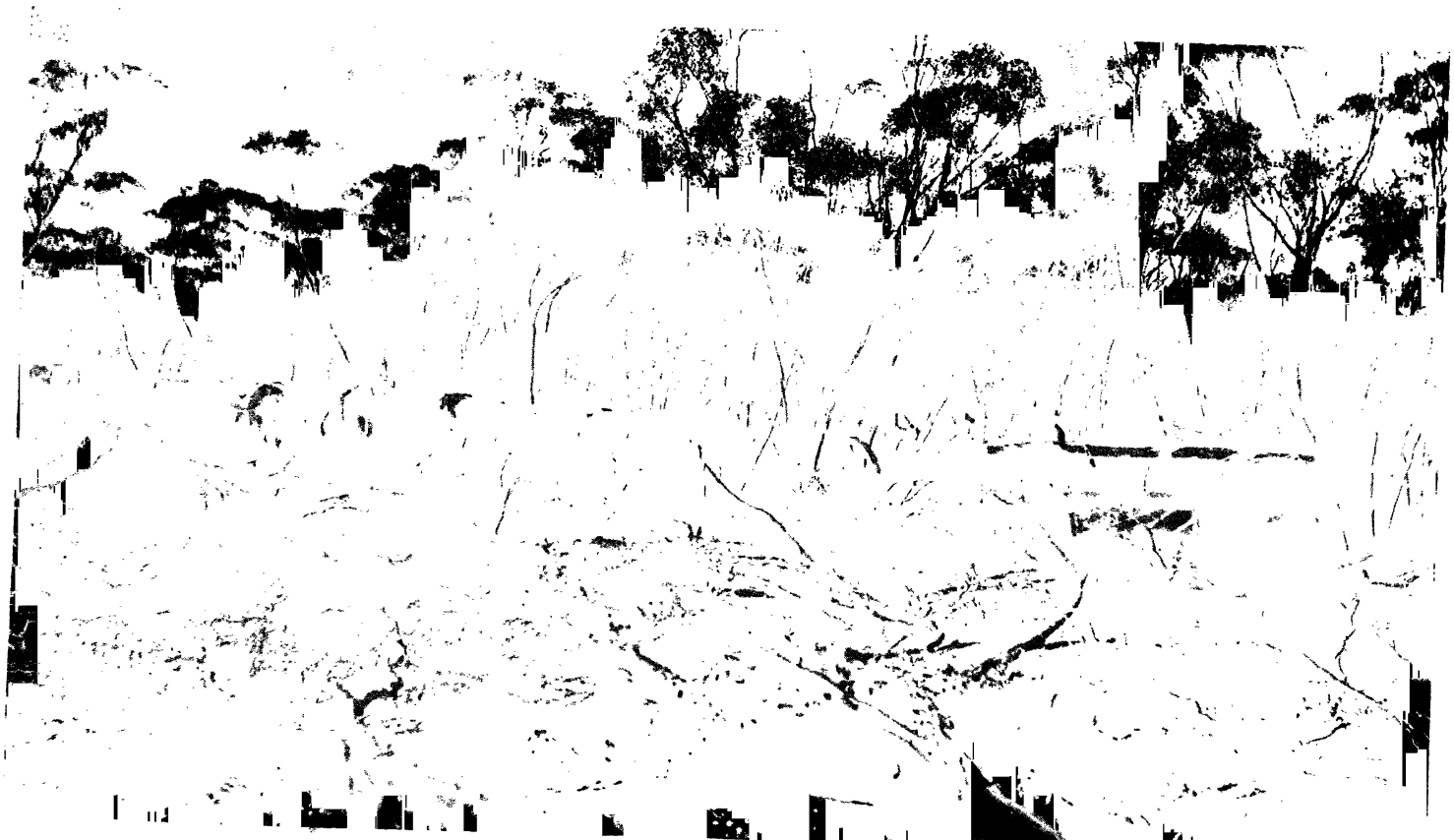
The statesmen and Parliament of the mother country assisted in every way the adjustment of the differences that arose in creating the Dominion and embodied in the British North America Act the result of the Quebec Conference. Prince Edward Island was incorporated in the



Photograph from Paul Thompson

GRADING HEMP: NEW ZEALAND

The manufacture of hemp from the fiber of the native flax can hardly be called a new industry in New Zealand, for her people have been trying it for at least thirty years. Their product has had an uncertain place in the world's market, however, for it is used as a substitute for manila, and when the price of that commodity was low New Zealand hemp was almost unsalable. In late years a great deal has been done to improve its quality and a market has been created for it. Much of it is sold to be spun into binder-twine, and the Japanese are said to be able to imitate silk with it.



Photograph from Lieut. W. K. Harris

CLEARING THE MALLEE SCRUB LANDS BY "ROLLING-DOWN" PROCESS: AUSTRALIA

When the brush is dry it is burned, and the land is then ready for plowing. "Mallee" is an evergreen shrub which grows as a short-stemmed bush in five or six shoots from one stump and reaches an average height of 12 to 20 feet. The trunk is seldom much thicker than a man's wrist, and it can hardly be called a tree, but it spreads with extraordinary closeness.



Photograph by A. Nielen

PET KANGAROOS: MELBOURNE, AUSTRALIA

Australia, which is the largest island or the smallest continent, depending upon how one desires to refer to it, is the habitat of many curious animals, the best known of which perhaps is the kangaroo. The weight of this strangely constructed animal is upward of 200 pounds when full grown, and in past ages scientists tell us was two or three times as large. One of its peculiarities is a pouchlike fold of the skin in which the female can carry her young. This, however, is not entirely confined to the kangaroo, but is a part of the equipment of about two-thirds of the mammals of Australia. There is a curious disproportion between the forward and rear quarters of the kangaroo, the fore feet and legs being very small and the hind legs of enormous size and strength. With these latter, assisted by a huge tail, the kangaroo makes its way by means of tremendous leaps across the grassy plains, where in earlier days it was found in great droves.

union in 1867. The British North America Act offered an opportunity for the western provinces to come in as the Dominion government should permit and require.

WHEREIN THE CANADIAN CONSTITUTION DIFFERS FROM OURS

The framers of the Constitution of Canada thought it an improvement on the Constitution of the United States, in that the defects which the latter was supposed to have shown in the Civil War were corrected. Sir John McDonald in his opening remarks at the Quebec Conference said of the situation when our Constitution was framed:

"There were 13 individual sovereignties, quite distinct the one from the other. The error at the formation of these constitutions was that each State reserved to itself all sovereign rights save small portions delegated. We must reverse the decision by strengthening the general government and conferring on the provincial bodies only such powers as may be required for local purposes."

I think it is the general opinion now

that this view of the Constitution of the United States was a mistaken one. The adoption of the 13th, 14th, and 15th amendments strengthened somewhat the restraint upon State legislatures enforceable in the Supreme Court of the United States, but generally the division of power between the States and the general government remained the same.

And yet, as our Congress has exercised powers which she always had, but which she had not before exercised, the strength of the central government is seen to be quite all that it ought to be. There is danger that a great widening of the field of Federal activity and a substantial diminution of State rights would in the end threaten the integrity of our Union instead of promoting it.

However, the Quebec Conference, fearing secession, took the other view, followed MacDonald's recommendation, and agreed that in the division of powers between the Dominion government and the provincial governments the residuum should be in the Dominion government, and not be reserved either to the provinces or to the people, as with us.

The Dominion Parliament is made up of a Senate composed of Senators appointed by the government for life and of a popular House of Commons.

Another very great difference between our Constitution and that of Canada is that, while the guaranties of civil liberty in our own Constitution are all express, as insisted on by Jefferson and Madison, though not thought necessary by Hamilton, they find such sanction as they have in the unwritten British Constitution, and are left not to the courts, but to the protection of an executive veto of provincial or dominion legislation. This really gives an opportunity for much more radical legislation in Canada with reference to vested rights than we have in this country. This may not be so important now as it will be later, when a revulsion against the danger of corporate political control and a plutocracy, which is likely to threaten Canada in the future, shall give rise to not only needed regulation and restriction, but also to such excessive and indiscriminate attack upon capital investment such as we have seen in some parts of this country.

AUSTRALIA LIKED OUR CONSTITUTION BETTER THAN THE CANADIAN

It is a noteworthy significance that when the Australian Commonwealth was formed by the union of the various Australian States or provinces, about 1900, the Constitutional Convention followed more closely in the division of powers between the government of the Commonwealth and its associated and constituent States the principle of our Federal Constitution.

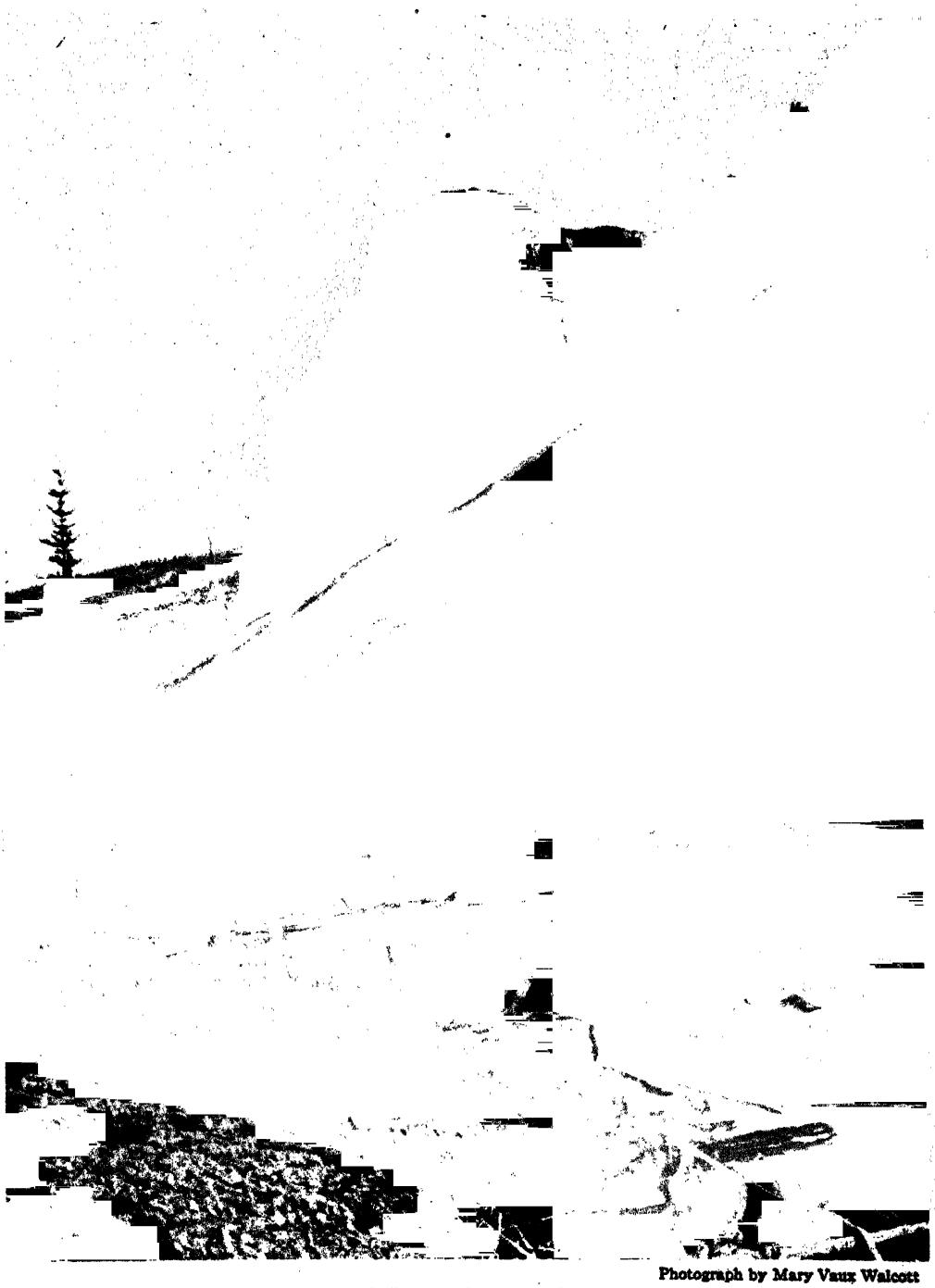
In other ways that Commonwealth followed our fundamental law more closely than Canada. Its Senate is made up by the equal representation of all the constituent States, and in the reserving to the States and to the people the residuum of power; so that the grants of power to the Federal government in Australia are to be construed as they are construed in our Constitution.

The framework of the fundamental law of Australia is based more on popular control than is that of Canada, and it is more independent of the mother country, in that the construction of its Constitution in the matter of the distribution of powers between the States and the Commonwealth is left to the Supreme Court of the Commonwealth, without a right of appeal to the British Privy Council except upon allowance of the Supreme Court, while in Canada a right of appeal in such cases is absolute.

SOME DIFFERENCES IN THE GOVERNMENT OF CANADA AND AUSTRALIA

A reason for the difference in the constitutions of Australia and Canada is doubtless found in the fact that the Canadian Constitution was adopted during the Civil War, when our Constitution seemed to have failed in securing power enough to the central government; and the Australian Constitution was adopted at the beginning of the 20th century, when our Constitution had shown itself able to weather the storms of secession and to authorize a central government continually increasing in strength with the growth and settlement of the country.

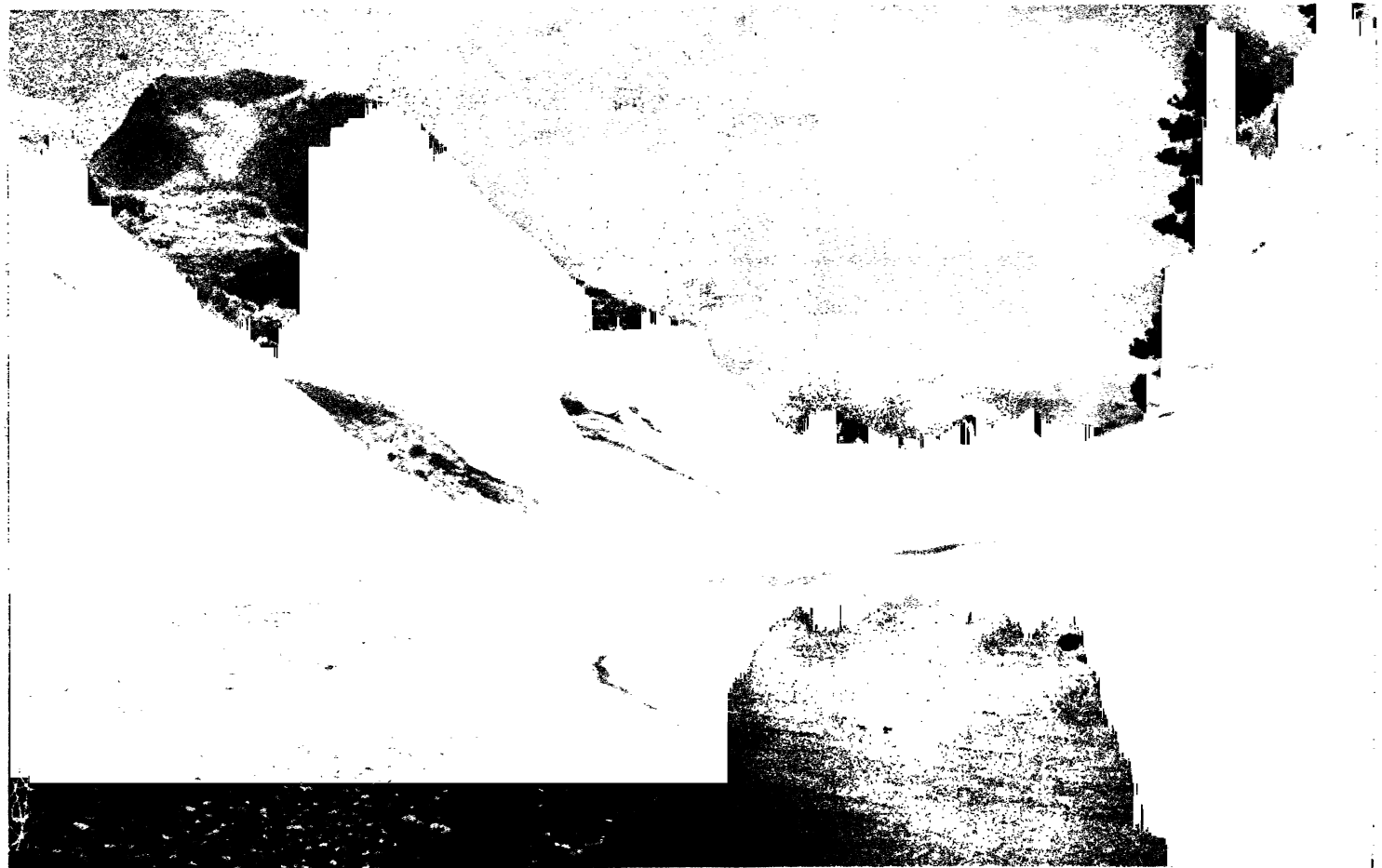
The difference in the manner of selecting the Senate, which in Canada, as



Photograph by Mary Vaux Walcott

TOWER OF BABEL, MORAINE LAKE, ALBERTA

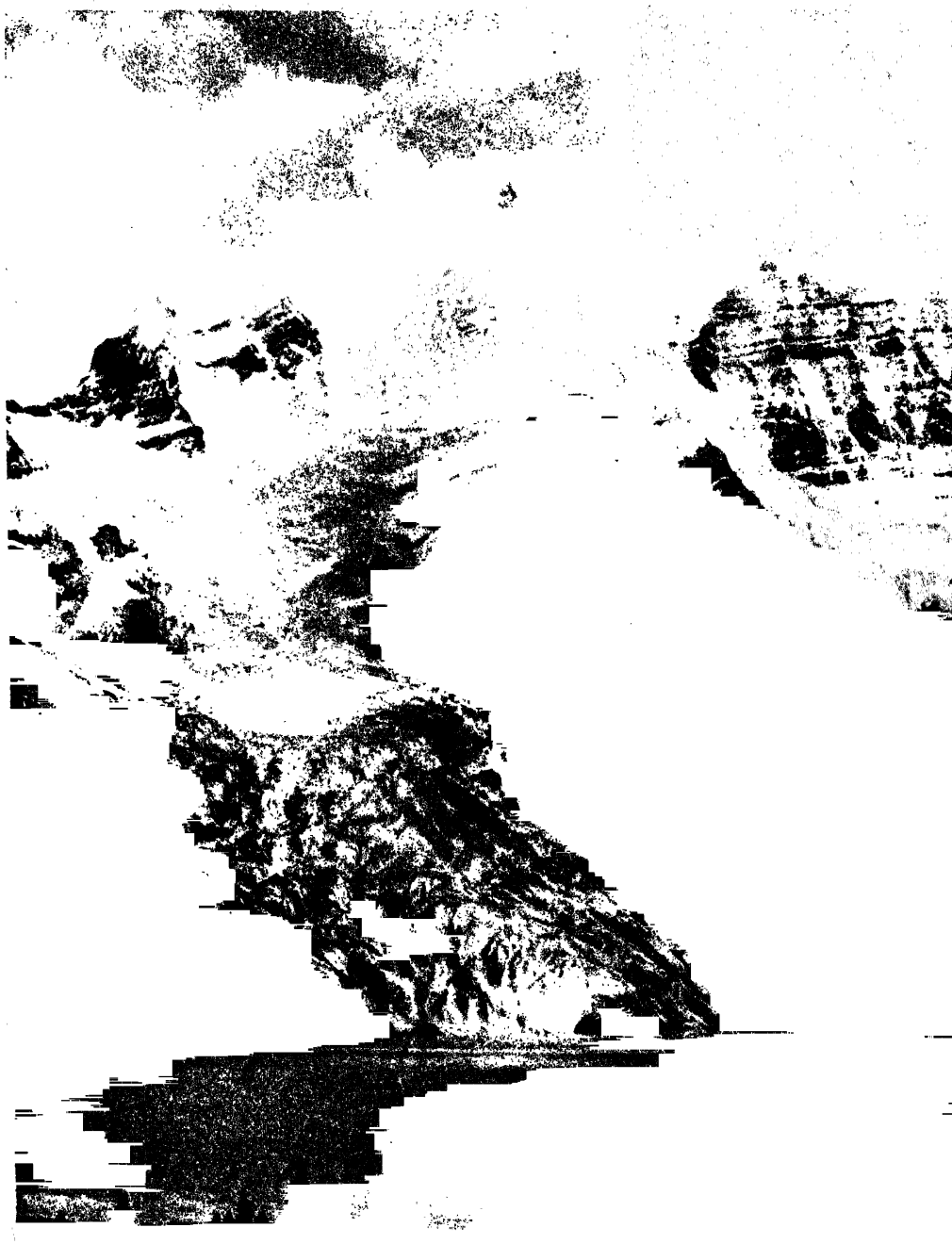
Moraine Lake is reached by a drive of ten miles from Lake Louise. It nestles in the Valley of the Ten Peaks, at the base of the chain of mountains that give the valley its name. The Tower of Babel is a cliff at the north end of the lake; the higher mountains extending towards the southwest.



Photograph by Mary Vaux Walcott

MOUNT ROBSON FROM THE NORTH

The stream in the foreground flows into the Frazier River, and so on to the Pacific, while that behind the camera finds its way into the arctic watershed. A good trail leads from Robson Station to this point.



Photograph by Mary Vaux Walcott

BLUE, OR TUMBLING GLACIER, FED FROM THE VAST SNOW SLOPES OF MOUNT ROBSON

The tongue of the glacier as it is pushed down into the lake breaks off in numberless bergs, at the arch, thus giving the name—Berg Lake. The ice arch is very large and perfect.



Photograph by George F. I

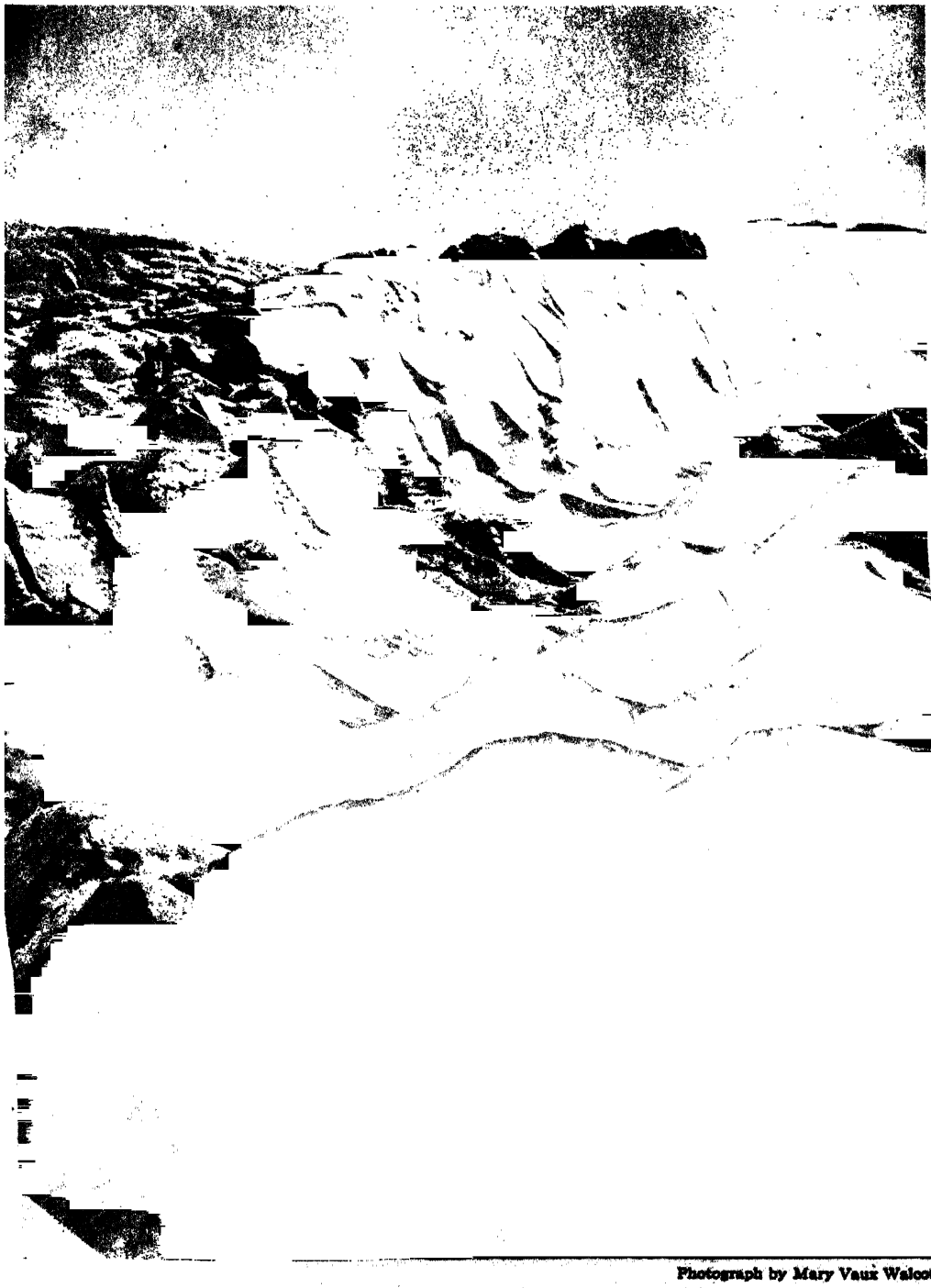
MOUNT ASSINIBOINE, THE AMERICAN MATTERHORN

Remarkable as one of the most beautiful of the Canadian peaks, Mount Assiniboine, first ascended in 1901 by James Outram, towers 11,860 feet into the clouds near the boundary between British Columbia and Alberta, about twenty miles south of Banff. Rising in a great pyramid to the sky, Assiniboine much resembles Switzerland's pride, the Matterhorn, although Mont Blanc is even more its prototype, and the similarity becomes at once apparent to the observer. This giant tooth of the Canadian Rockies was named for an Indian tribe of that region.



Photograph from R. P. Getty

VILLAGE GOSSIPS, CANADA



Photograph by Mary Vaux Walcott

ILLECILLEWAET GLACIER, BRITISH COLUMBIA

The Illecillewaet Glacier is easily reached from Glacier, British Columbia, over a beautiful trail one and three-quarter miles from the railroad. The ice fall is very picturesque, and in this view the characteristic blue bands are shown, as well as the seracs, with their separating crevasses.

already said, is by appointment of the existing government for life, while in Australia it is by election for a term, is explained by the more democratic spirit in Australia, and also because of the citizenship of two races in Canada, while in Australia the people are homogeneous and all English.

In Canada there was doubt as to who would possess the greater voting power as the country grew, the English or the French. This situation was thought to require a conservative Senate, which would mitigate the power and possible injustice and prejudice of the popular majority of either race.

The fact, too, that the constituent States in the Australian Commonwealth had long exercised independent and separate power, and naturally leaned toward a retention of as much power in the separate States as was consistent with an effective Commonwealth, reproduced the situation which existed at the time of the framing of our Constitution.

On the other hand, in Canada, when the Dominion was formed, the dominant States or provinces of Quebec and Ontario had been united under a complete and all-inclusive government by a single legislature since 1841.

In the case of Australia, it should be noted that the making of the Commonwealth was not left only to delegates, as in the Quebec Conference, but was confirmed by referendum to the people of all the constituent States—a procedure indicating the greater insistence upon the rule of the people among the Australians.

THE CONFEDERATION OF SOUTH AFRICA

Some ten years after the formation of the Commonwealth of Australia the South African Union was formed. In creating this, the conditions calling for the union were quite different from those which had existed when the Dominion of Canada and the Commonwealth of Australia were established.

In South Africa the British domain included Cape Colony, the Orange Free State, the Colony of Natal, and the Colony of Transvaal, together with an extensive hinterland. The bitter and bloody conflict in the Transvaal War had naturally left a condition which required care in the making of the new government and presented different problems from those of Canada and Australia.

It was necessary to strengthen much the central government at the expense of the federating States. Indeed, the breadth of the powers of the central government in South Africa, as compared with those of the Dominion or Commonwealth, is so great that accuracy in calling the South African Union a federation at all may be questioned.

The central government has a general grant of power "to make laws for the peace, order, and good government of the Union." No other power is conferred, and this is because any subsequent enumeration of powers would have only weakened the grant.

The powers of the constituent provinces hardly exceed those that might be granted to a county council in England or to a general municipal corporation in this country. There is equal representation of the provinces in the Senate and a popular district representation in proportion to the electorate for the lower house.

The powers of the executive are much enlarged because of the presence within the jurisdiction of a large number of native races. The Union government today has under its control 5,000,000 natives within the territory of the States making up the Union, and outside of the States 2,000,000 more.

In spite, however, of these differences in favor of the power of the central government, the government is a popular one, and representative directly or indirectly of the people.

In all these associated British governments of which I have been speaking—in Canada, Australia, and South Africa—an independent judiciary like that of the mother country has been provided by appointment of the executive and a tenure for life. In this respect the new State-makers wisely followed the British and our Federal Constitution.

ALL THESE NEW ENGLANDS ORIGINATED WITH THE PEOPLE

The first fundamental fact that we note in the organization of these govern-



Photograph from Lieut. W. K. Harris

CABBAGE TREES ON THE SOUTH COAST OF NEW SOUTH WALES

The British first occupied Australian soil when, in 1788, Arthur Phillip, a captain in the Royal Navy, arrived in Botany Bay with eleven ships, bringing 750 convicts. These convicts had been sentenced to transportation from England, and were brought to Australia because the American Colonies, having just become independent, could no longer be utilized as a dumping ground. Finding the shores of Botany Bay unsuited to the requirements, Captain Phillip went further up the coast and established his settlement where Sydney now stands. This system of transportation continued until 1868, when the last Australian State refused longer to allow it. The convicts, men and women, were used as laborers by the freeholders.



Photograph from Lieut. W. K. Harris

FAIRY DELL FALLS, IN THE BLUE MOUNTAINS OF NEW SOUTH WALES

We are accustomed to associate glaciers and perpetual snows with mountain ranges, but in all the mountains of Australia there is no such thing as a peak capped with perpetual snow, and there is not one single glacier in all the land.

ments is that their formation originated with the people, and that they are popular governments; that while the framework of each was the subject of discussion with the home ministry in Great Britain, Parliament did not pass the acts which gave them legal life until they had the full consent of the people of each of these nations—for nations they are.

No pressure was brought by the mother country to amend in any substantial way the constitutions suggested. A practically complete autonomy has been recognized and encouraged by the home government in all these New Englands.

The union of the separate States into these federations has reduced the powers of interference or control of the home government which it had with the separate States which were being federated. Indeed, those powers have been minimized quite beyond the recommendations of the Earl of Durham.

The foreign trade of these New Englands is for their independent judgment. Protective tariffs are permitted even against England, and separate reciprocity agreements with other countries have been put in force. While the mother country must in the nature of things retain some control over their foreign relations, the practice has been in all diplomatic negotiations which concern them to allow them a representative in the negotiations. This was the case in the Joint High Commission to consider the differences between England and the United States growing out of the Civil War, in 1871, when Sir John MacDonald was one of England's representatives, and the practice has continued ever since.

There have been times in the history of Canada when there was a decided bent on the part of some elements in the population toward annexation to the United States or independence. With the ex-



Photograph from Lieut. W. K. Harris

CLIFFS OVERHANGING NATIONAL PASS, IN THE BLUE MOUNTAINS, NEW SOUTH WALES

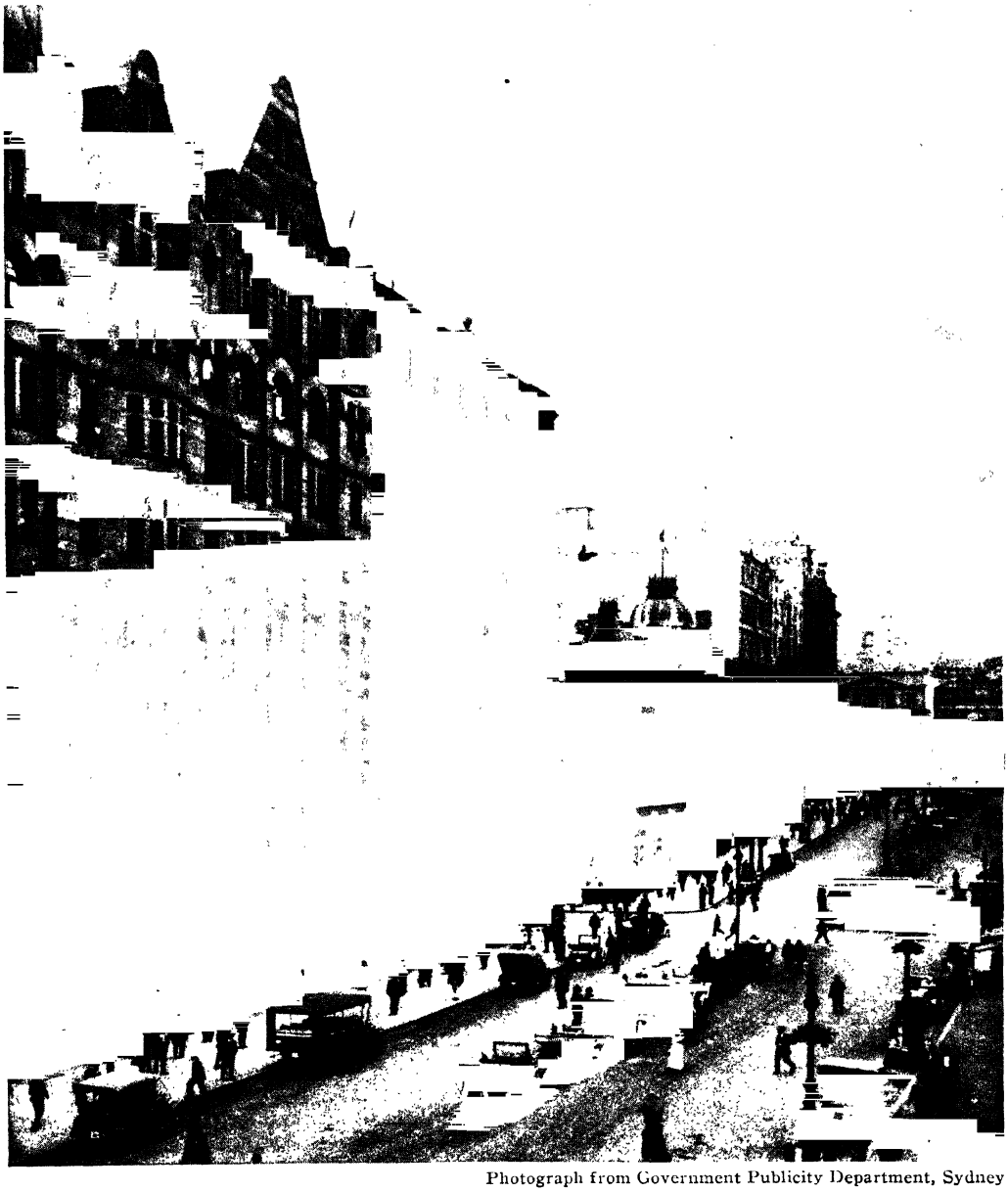
Geologists tell us that the continent of Australia is one of the oldest existing land surfaces, having been good dry land when much of what is now Europe and Asia was still under water. Its mountains are low, mere worn-off stumps, it would seem, for the greatest peaks are only about 7,000 feet high. In the interior the scenery becomes rather monotonous because of its flatness, but in the mountainous country, which follows the general direction of the coast-line, wonderful views, full of color and variety, are to be had upon every hand.

ception of a small but vociferous faction in Quebec, this feeling has entirely disappeared.

In South Africa there had been, as a condition, the Transvaal War and the objection of the Dutch colonists to English control. That was solved by the war and by the statesmanlike dealing with the question under Lord Milner and others since that time; so that now, in a marvelously short period, and because of the generous and just dealings of England with the dissentient Dutch element, a desire to separate from England has been confined to a comparatively few, if we can judge by the insignificance of the rebellion headed by De Wet since the war began.

GREAT BRITAIN IS NOW REAPING HER REWARD

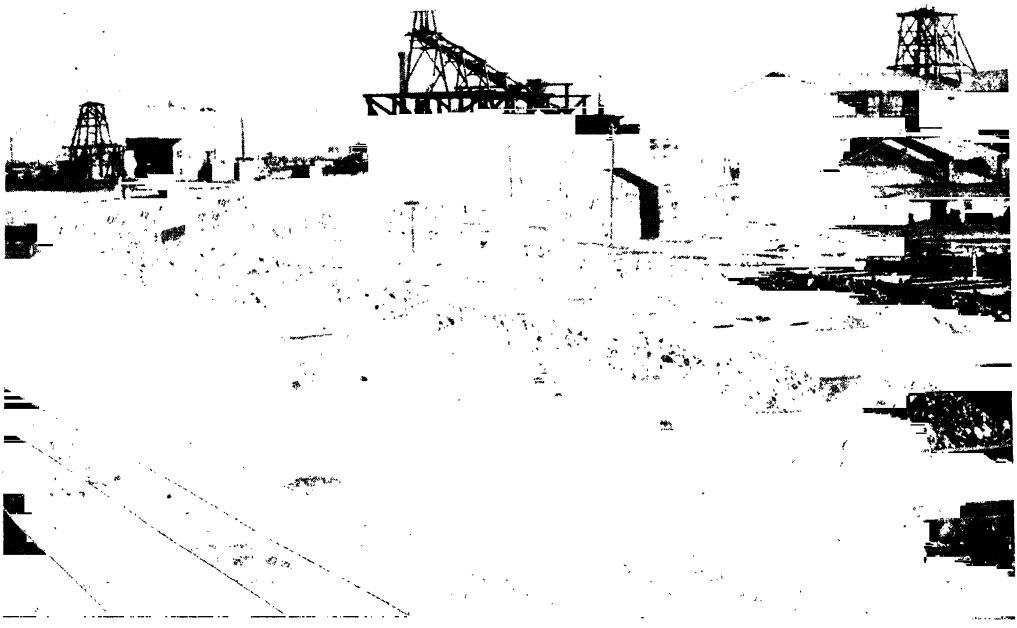
England has levied no taxes, has required from these dependencies, if they may be called such, no contribution to the heavy cost of the imperial defenses of herself and her New Englands and her other dominions. Whatever has been done in the way of the construction of a navy by Australia and whatever has been proposed to be done by Canada in this regard have been entirely voluntary.



Photograph from Government Publicity Department, Sydney

MARTIN PLACE, IN SYDNEY, NEW SOUTH WALES

This Sydney street reminds one of Michigan avenue, Chicago, and the resemblance is carried still further by a similarity in the personality of the two cities. The same enterprising atmosphere prevails in this Australian metropolis as exists in our own city at the foot of Lake Michigan. Sydney, the capital of New South Wales, and Melbourne, the capital of Victoria, vie with each other for commercial supremacy, and in each of them live nearly one-half of the people of its State—a fact that is deplored by Australian economists, who believe that there should be less congregating in cities and more settling upon the land.



A COLLIERY IN NEW SOUTH WALES

Australia is rich in natural resources, and not least among them is coal. This product forms one of the most valued yields of New South Wales, the total area of carboniferous strata in this State being estimated at about 24,000 square miles. Much of the coal is shipped from the city of Newcastle, an important commercial center, on Port Hunter, about a hundred miles by rail north of Sydney. This city has excellent wharfage facilities and the docks extend along the shore for nearly three miles. Its total tonnage of exports in a given time frequently exceeds even that of Sydney itself.

The truth is that it is hard to imagine a relationship between a mother country and peoples who recognize allegiance to that mother country under which the mother country could exercise less real control than under the three governments which I have thus inadequately described.

Of course, in each the King has been represented by his Governor General, and in each there is some power, but rarely used, to veto legislation on imperial grounds. There is, as already said, an appeal to the Privy Council—absolute in the case of Canada and the South African Union, but qualified in the Australian Commonwealth.

Chastened by her experiences in the war of the American Revolution, learning in her dealings with her people and their government in the furthermost parts of the earth how to promote their happiness and thus to treasure their love, Great Britain is now reaping her reward.

Canada has sent abroad 125,000 troops to reinforce the British army and has 125,000 more ready to go. The proposal now is to increase this number—and it will probably be carried out—to 500,000 men, or one-sixteenth of the entire population of Canada. Canada is spending over $1,000,000 a day in support of this military policy.

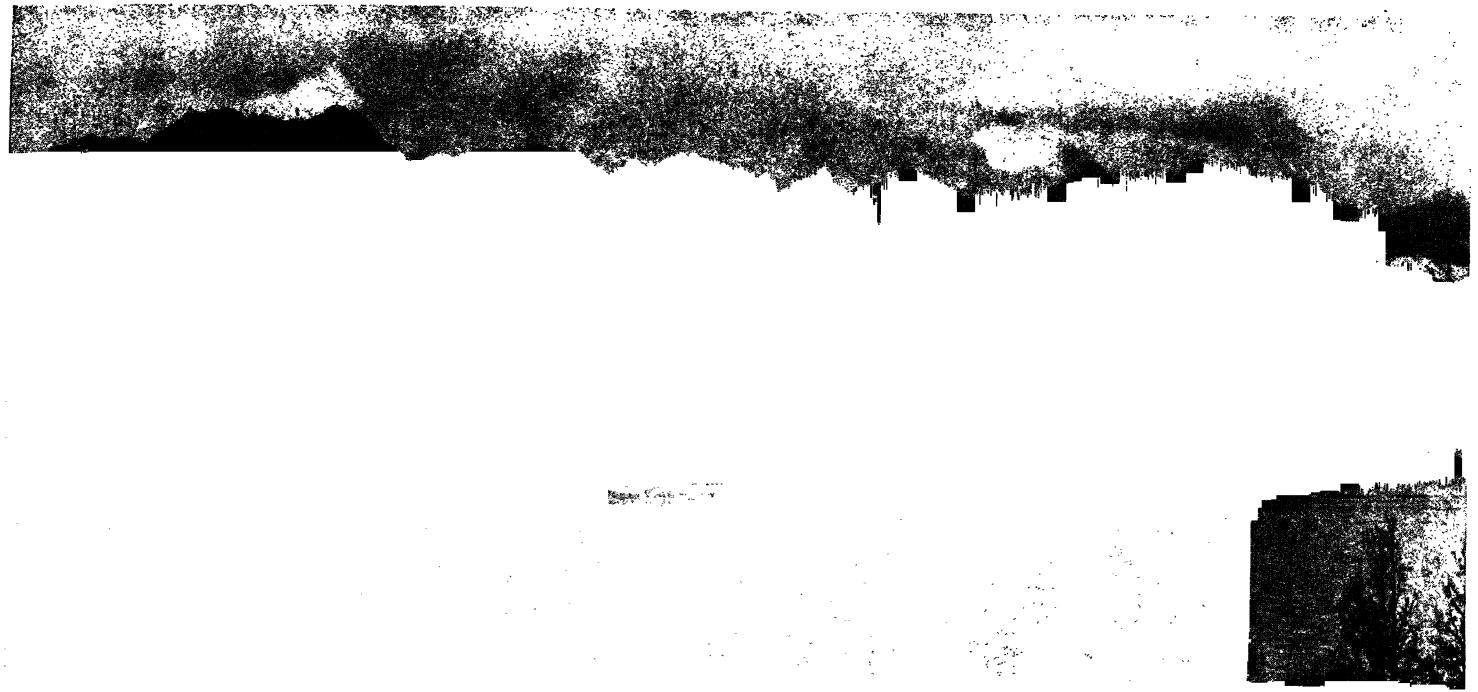
She has existing heavy obligations incurred in the construction of railways by



Photograph from J. C. Grew

A ROADWAY CUT OUT OF SOLID ROCK IN BULLER GORGE, NEW ZEALAND

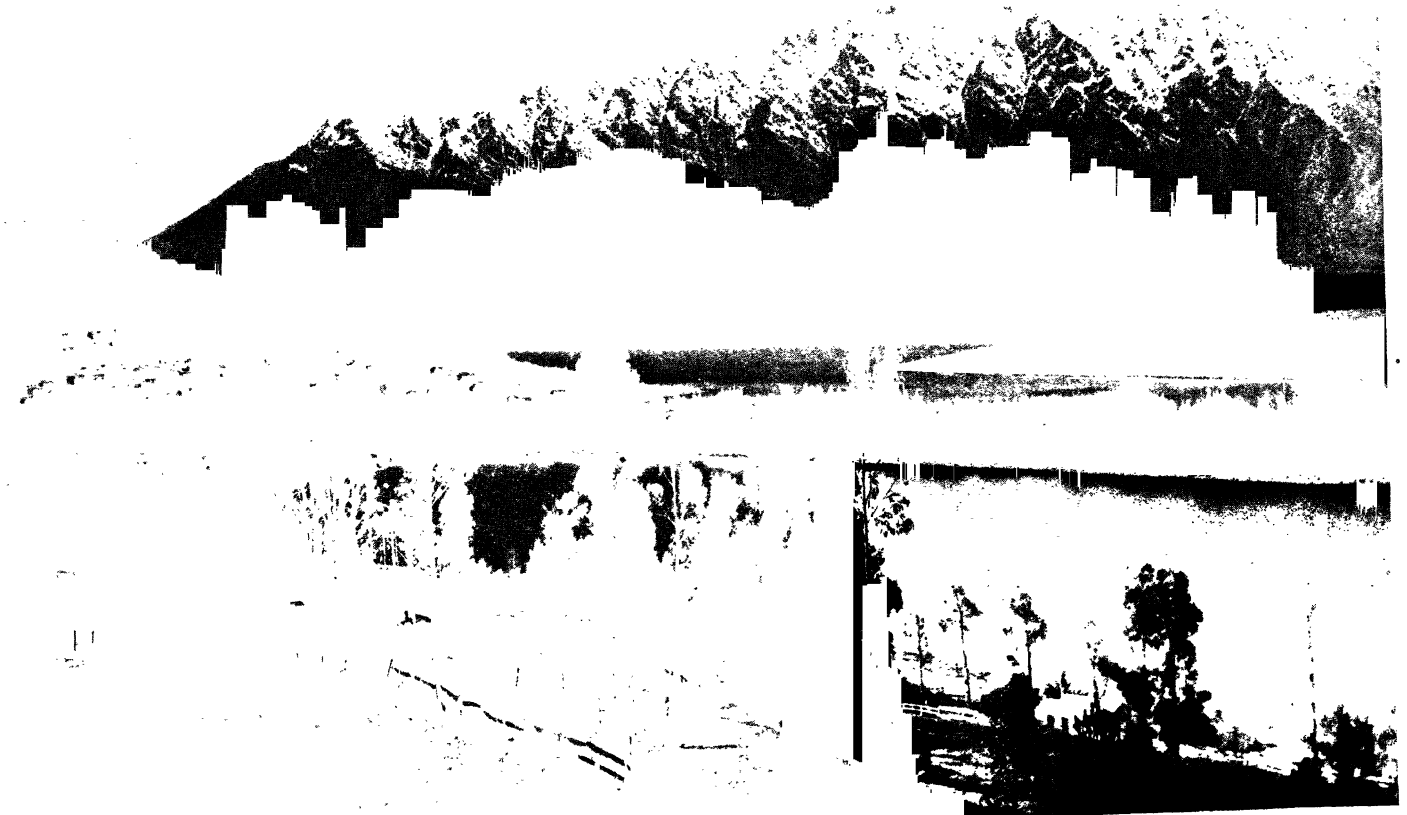
New Zealand has glaciers, waterfalls, and volcanic peaks without number. Mineral springs and pools of water of every temperature, from ice-cold to boiling-hot, together with geysers and mud volcanoes, abound, and these, beside providing unusual scenery, furnish the location for many health resorts.



Photograph from New Zealand Government Tourist Department

THE REMARKABLES: LAKE WAKATIPU, NEW ZEALAND

South Island, New Zealand, is the Switzerland of the South Seas, for in its interior tremendous mountain ranges pile one upon the other until the lofty peaks thrust their snowy crests through the very clouds. Lakes there are in profusion, very deep and of vivid hue. The rivers are mountain torrents and on the island's southwest side there are more than a dozen deep fiords which bring the sea almost into the heart of this gged country. This island is less than 200 miles wide at its broadest place, and Mount Cook, a little over 12,000 feet, is its highest point.



Photograph from New Zealand Government Tourist Department

ANOTHER VIEW OF LAKE WAKATIPU AND THE REMARKABLES: QUEENSTOWN, NEW ZEALAND

Country life in New Zealand is described as delightful. The solitude of early colonial days has now practically ceased to be continuous except in the few scattered outposts, and the country is becoming filled with capable, independent farmers. Where in other days attention was only given to securing the very necessities of existence, much is now being done to beautify the homesteads, and, even though the farmer's house may be only a cottage, it is now likely to be vine-covered, with a garden and orchard to be proud of.



Photograph from Government Publicity Department, Sydney

ON THE ROAD TO TWEED HEADS: NORTH COAST, NEW SOUTH WALES

The climate of the southern part of Australia is for the most part ideal, the thermometer varying not much more than 20 degrees throughout the year. In summer there is an average temperature in New South Wales of about 72 degrees and in the winter months about 52 degrees. Its rich soil is well watered and, assisted by the even temperature, the valleys and lowlands are covered with a luxuriant herbage.



Photograph from Lieut. W. K. Harris

THE WONDERFUL HAWKESBURY BRIDGE: NEW SOUTH WALES

The Hawkesbury Bridge is one of the largest and finest examples of engineering skill in the southern hemisphere and embodies all the latest improvements in bridge designs. The most difficult part of the work in connection with the construction of the bridge was the great depth to which it was necessary to sink the piers to secure a good foundation. The body of each pier is 48 by 20 feet, with rounded ends, enlarged at the base to 52 by 24 feet, and some of the piers are sunk to a depth of no less than 162 feet below high-water mark, which is said to be the deepest bridge foundation in the world. The abutments are built of local freestone and are very fine examples of stonework. The piers from 3 feet below water are built of masonry. The superstructure of the bridge is built for a double line, and the main girders or trusses are 410 feet long between centers of end pins and 58 feet effective depth at center. The bridge is built of steel throughout, and its total length between abutments is 2,896 feet.

pledging her credit to aid them. In the Intercolonial, in the Canadian Pacific, in the Grand Trunk Pacific, and in the Canadian Northern, obligations have been assumed that might well frighten a country with 8,000,000 of people. But now, in spite of these great burdens, which conservative financiers have looked upon with great concern, she proposes to take over a new huge debt before the conclusion of this war.

Only a young people with great national spirit, with a great territorial empire and magnificent resources, prompted by the deepest loyalty to the principles of civil liberty and popular government like that of Great Britain, could boldly and calmly face a future so full of difficult problems and unparalleled financial obstacles.

Speaking of the history of Canada down to 1912, since the British North America Act, in 1867, Professor Wrong, professor of history in the University of Toronto, said:

"The history of Canada during this momentous period is not a tale of courts and camps, of the workings of diplomacy to avert or to lead to war, of the struggles between those who cherish what is



Photograph from Government Publicity Department, Sydney

WHEAT TEAMS LEAVING A FARM IN THE WESTERN DISTRICT: NEW SOUTH WALES

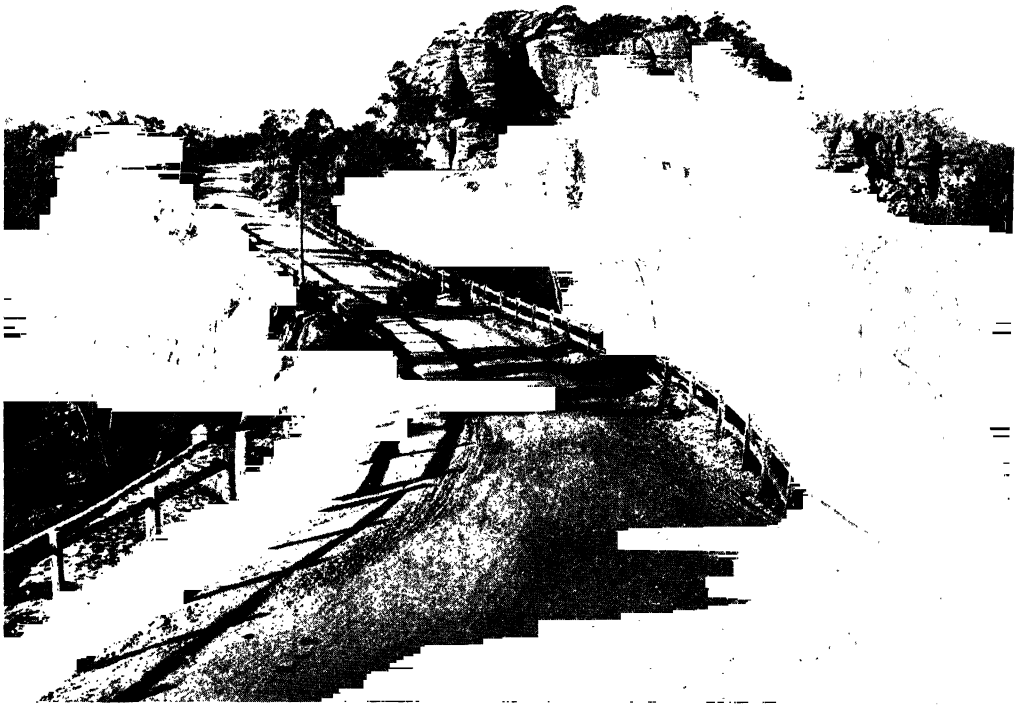
They do most things in Australia on a large scale, and, next to sheep raising, agriculture is the principal industry. At present there are possibly 10,000,000 acres of land under cultivation, and approximately two-thirds of it is devoted to the production of breadstuffs. The enormous wagons, on which are piled nearly a hundred great bags of grain, are drawn by teams of ten or twelve horses from the farms to the railroad, sometimes many miles away.

old and what they think is good advantage and those who dream of a new and better order. The pomp of a stately and well-ordered society, movements in art and literature, the menaces and friendships of other nations, have but little place in the narrative. The story is one of internal organization, or trade policy, of the occupation of land hitherto almost unpeopled, of the opening up of communication and the building of railways and canals, of the working of political institutions, of the disputes of the central government in its relations with the provincial powers. In one sense it is not a dramatic tale; it has little of the ceremonial of Old World movements. But, none the less, it is a profoundly romantic story of the birth of a nation and of its passing from neglected obscurity into a conspicuous place."

THE BAPTISM OF FIRE

Today Canada is passing through her baptism of fire. While there are many differences in the history of Canada and that of the United States, there are many resemblances—due, if nothing else, to the common origin of their peoples and to the material problems of settling and developing half a continent.

In our Civil War our peoples divided on an issue that developed the moral strength of the two great contending sections. Both showed themselves willing to make the ultimate sacrifice of their own lives and the lives of those dear to them and of all their material possessions. In that Civil War the people of the United States found themselves and proved to themselves and to the world their moral fiber and their greatness as a people.



Photograph from Lieut. W. K. Harris

MOUNT VICTORIA PASS: BLUE MOUNTAINS, NEW SOUTH WALES

Most Australians thoroughly appreciate their good roads, for the time is not long since when over the same route which an automobile now traverses in one short afternoon their fathers spent six weeks in hacking a way through the dense bush for their creaking bullock carts to negotiate.

Canada is now going through a similar experience. Every family with young men of military age in the Dominion has offered, is offering, or expects to offer them up as possible sacrifices upon the altar of their allegiance to the mother country.

What is going on in Canada is also happening among Great Britain's children in Australia and South Africa. As among the French in Canada, so among the Dutch in South Africa, England's justice retains for her a loyalty that a less equitable policy would have lost.

I have not at hand the number of troops furnished by Australia and South Africa to swell the British forces, but the graves of those New England sons in the battlefields of the Gallipoli Peninsula and elsewhere bear silent but eloquent testimony to the tie that binds them to old England.

Canada is from 2,000 to 5,000 miles from the British Isles. Australia and Africa are half around the world. Their people live under different conditions. They have a different government. They must perforce, because of distance, have different views of life. The remoteness of distance and condition has much to do with destroying interest and affection and loyalty.

When it does not do so, when the patriotic thrill courses through the veins and arteries of men in Ontario, Winnipeg, Saskatchewan and British Columbia, in Australia and at the Cape of Good Hope, as hotly as in men between Lands End and John O'Groats, we would find a cause; and we do find it in the wisdom of England in dealing so generously with her trans-Atlantic, Pacific, and African daughters, and in strengthening their loyal affection by granting independence of government and assurance of protection as members of her family.

Photograph from Paul Thompson

A MODERN NEW ZEALAND SHEEP STATION

In the old days sheep raising in this Pacific archipelago meant merely turning flocks upon the public domain and letting them feed upon whatever they could find, with no other object than producing wool. Nowadays these flocks are more carefully tended and there is much attention given to their feeding. Of late years many acres of turnips and succulent English grasses have been sown to give better quality to the mutton and the whole grazing industry has been placed upon a much more scientific and systematic basis.

ALL ARE ASSOCIATES IN A GRAND FEDERATION

The term "Empire of Great Britain" is, as applied to these governments, a misnomer. There is no imperial control in the Parliament or in the King over these peoples. They are associates of the mother country in a federation in which they enjoy complete autonomy, and the mother takes the great part of the burden of imperial defense.

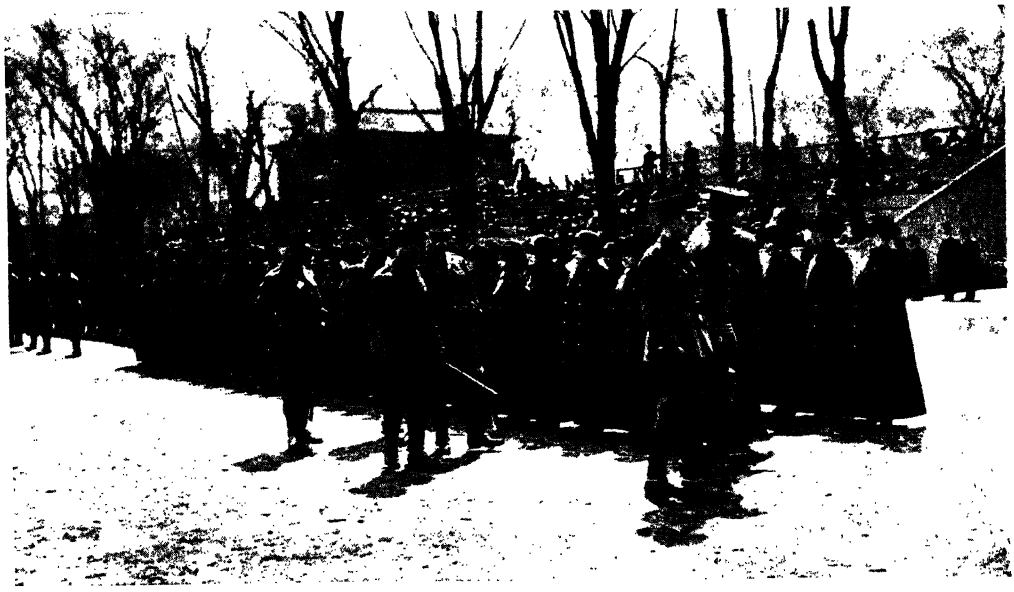
Gratitude for the burden she has carried for them, a realization of the benefits their association with her as part of the so-called British Empire secures them, and the love of the liberty regulated by law, secured under the British Constitution, which is the essence of their political lives and doctrine, are the reasons for this present wonderful manifestation of loyalty.

The ultimate fact that reflects the highest credit upon the statesmanship and foresight of England is that as she has lightened her formal hold upon these New Englands, and ended their real subordination, she has strengthened their spirit of allegiance to her.

It is an eloquent tribute to the living force of a bond formed of a common inheritance of civil liberty and the principle of the rule of the people strengthened by just and generous dealings of the mother with the daughters.

The supreme test has come in the present war. It has shown that there is something besides the prospect of material benefit or of material burdens and sacrifice which controls the action of peoples.

Well may England say, as these brave, courageous legions from the Transatlantic and from the Antipodes rally to her support: "I cast my bread upon the waters, and after many days it has returned unto me."



MANY CANADIAN WOMEN HAVE VOLUNTEERED AS NURSES FOR THE EUROPEAN WAR

This picture shows H. R. H. the Duke of Connaught inspecting those who went with the University of McGill Hospital Corps



Photographs by Chesterfield & McLaren

RECRUITING IN CANADA

Two men are here seen enlisting in one of the battalions of the Canadian expeditionary forces for service in Europe



CANADIAN RECRUITING OFFICERS AT WORK ON A CITY SQUARE, SEEKING VOLUNTEERS FOR OVERSEA FORCES



Photographs by Chesterfield & McLaren

SEEN EVERY WEEK THROUGHOUT THE DOMINION OF CANADA: TROOPS LEAVING INLAND POINTS TO EMBARK FOR THE EUROPEAN WAR



H. R. H. THE DUKE OF CONNAUGHT INSPECTING THE 42D BATTALION OF HIGHLANDERS AS THEY MARCHED OFF TO THE SHIP THAT CARRIED THEM TO EUROPE

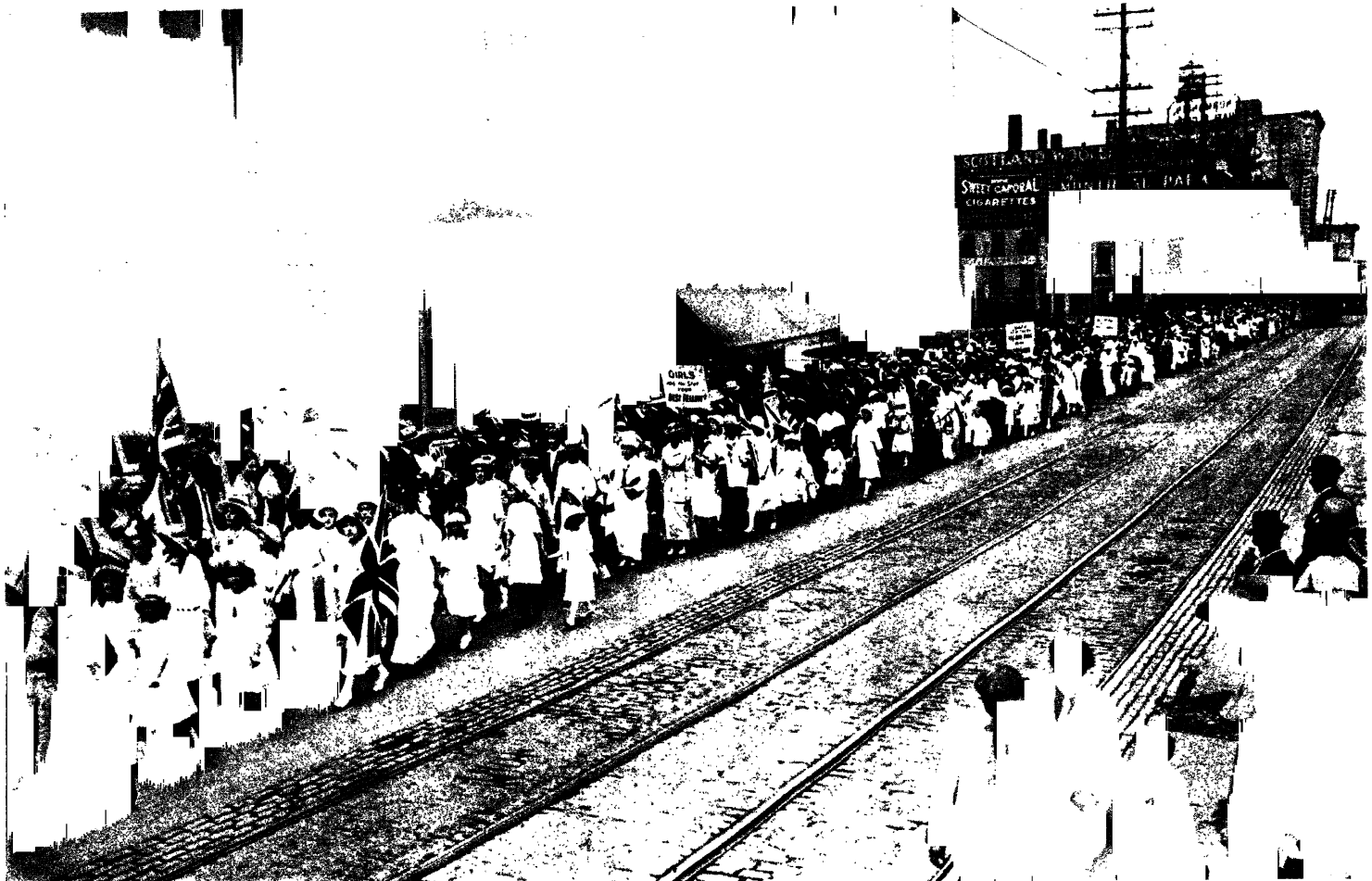
A sight to be seen at regular intervals in Canada



Photographs by Chesterfield & McLaren

QUAINTNESS IN RELIGION OF QUEBEC PROVINCE

A view which gives some idea of the huge numbers that will gather at an open-air mass



Photograph by Chesterfield & McLaren

A RECRUITING PARADE OF WOMEN AND CHILDREN WHOSE HUSBANDS AND FATHERS HAVE GONE TO THE FRONT, WITH THE OBJECT OF STIRRING UP MILITARY ENTHUSIASM



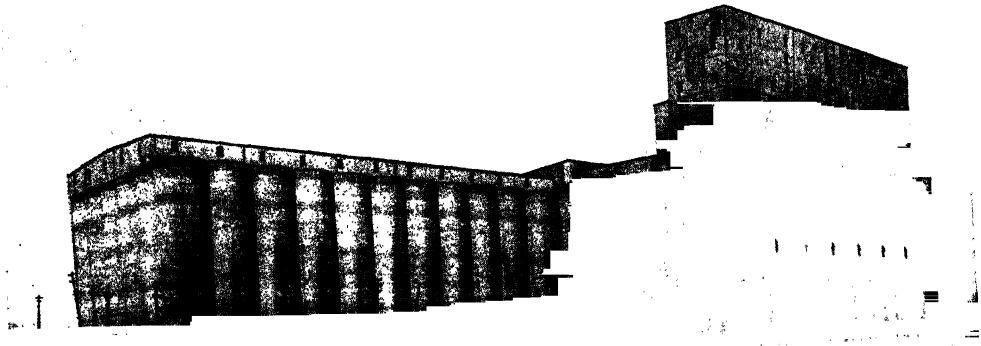
Photograph by Chesterfield & McLaren

THE OLD AND THE NEW AT THE ANCIENT CAPITAL

Troops in training for the present great war are here seen passing through the St. Louis Gate of the fortifications of Quebec City, which were built by British regulars after the conquest of 1759



FREIGHT STEAMSHIPS LOADING IN MONTREAL HARBOR



Photographs by Chesterfield & McLaren

FORT WILLIAM, ONTARIO, HAS THE LARGEST GRAIN ELEVATOR IN THE WORLD

Built by the Grand Trunk Pacific, Canada's newest transcontinental line, to facilitate transfer of western grain from rail to inland boat. Its capacity is 7,500,000 bushels, and it was planned so that its storage space can be trebled as the grain trade expands.



QUEBEC PROVINCE: A CHURCH CEREMONY AT ST. PATRICK'S, THE LEADING IRISH CATHOLIC CHURCH OF MONTREAL

Prominent business men act a guard of honor in the procession through the grounds of the church



Photographs by Chesterfield & McLaren

WINTER FESTIVITIES IN CANADA

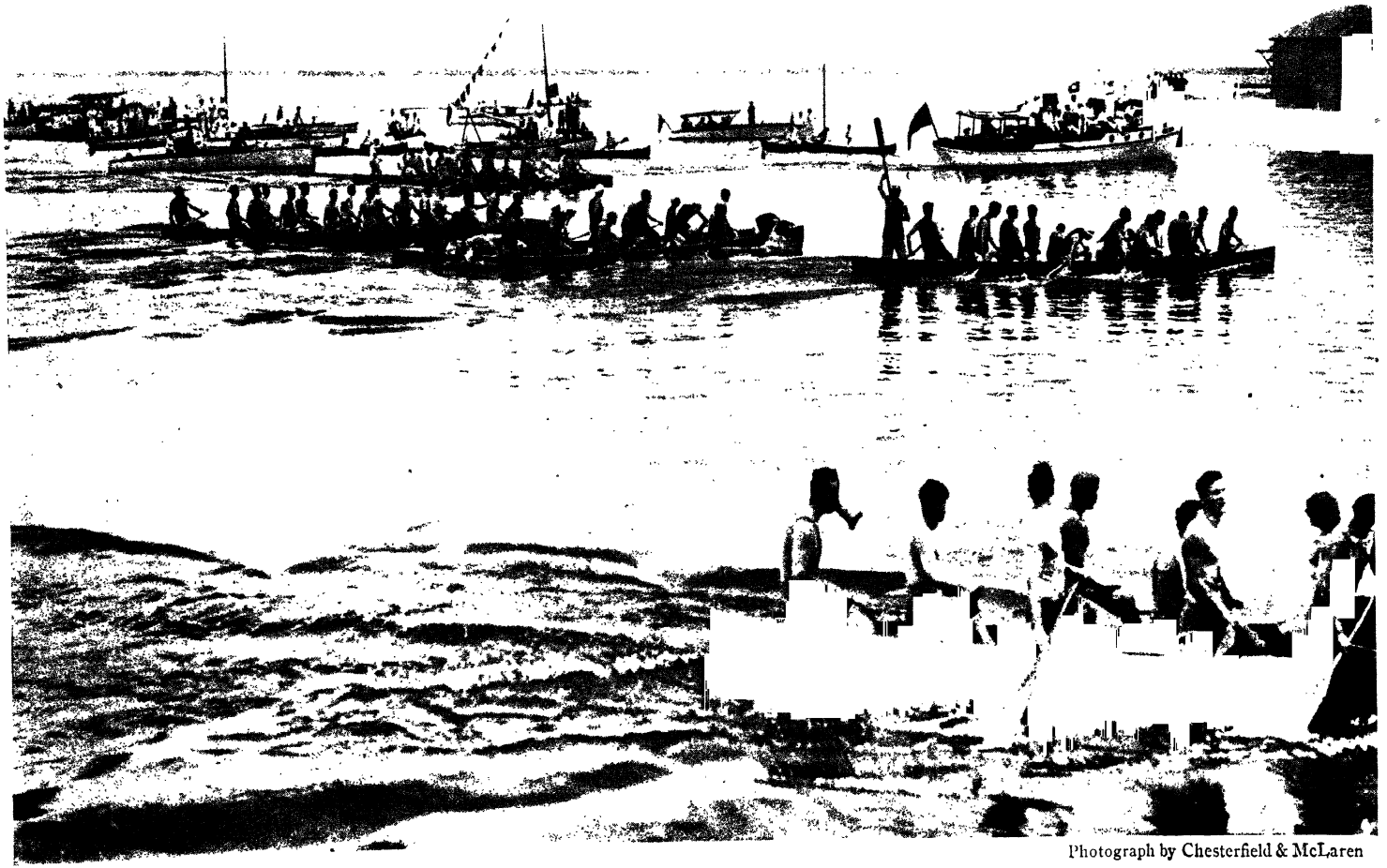
Street parade of snowshoe clubs on the occasion of a snowshoers' convention



Photograph by Chesterfield & McLaren

CANADA'S RUINED HOUSES OF PARLIAMENT

The Federal Parliament building at Ottawa was completely gutted by fire on March 1. It was said to have been the finest specimen of Gothic architecture in America, and is to be reconstructed as per original plans.



Photograph by Chesterfield & McLaren

WAR CANOE RACING, THE POPULAR AQUATIC SPORT

Every waterside town in Canada has its canoe club, and all members look forward to the annual races, which terminate in the Canadian Canoe Championship races at the end of the season. This picture shows the finish of one of the big races.



Photograph by Chesterfield & McLaren

"BOUNCING" IN CANADA

Winter climate is made the most of and all Canadians take an interest in outdoor sports. The picture shows a crowd of merry snowshoers "bouncing" one of their comrades when meeting him in the streets.

THE WORLD'S STRANGEST CAPITAL

By John Claude White

Author of "Castles in the Air," in the National Geographic Magazine, April, 1914

LHASA, the Place of the Gods, well deserves its name, as anything more beautiful can hardly be imagined than the vision of the sacred city set against its magnificent background of snow-capped mountains. Whether seen on a brilliant day, under a cloudless sky, during a thunder-storm, painted in soft, glowing tints by one of the wonderful sunsets seen only in Tibet, or by moonlight, when with outlines softened and toned down, the Potala stands out like a phantom castle in ghostly splendor from among the shadows of its surrounding trees, all aspects are equally lovely.

My readers are referred to the panorama of Lhasa, published as a supplement to this number of the Geographic Magazine.

The Potala is by far the finest building and eclipses all others in the beauty of its appearance. The present Potala was commenced in 1645 by the Grand Lama Nag-wang Lob-sang-gya-tsho, on the same site as a former building erected by Srong-tsan-gam-po, the king who founded the Jo-kang in the sixth century; and there is no doubt, I think, that the city is an ancient one and was in existence more than 1,200 years ago, although we can find no records giving any authentic historical account.

A DOMINATING STRUCTURE

The Potala dominates everything in Lhasa. The enormous mass of buildings, partly monastery, partly palace, and partly fortress, is built on a rocky ridge which stands out in the center of the valley, commanding the town and dominating the whole situation. Its architecture is magnificently grand, bold in outline and design; it towers above everything, with its gray white walls and buttresses, its immense flights of steps and terraces dotted with red-robed monks ascending and descending from religious ceremonies; its dull madder-red temple walls, with carved and painted windows, showing behind black brown yak's hair hangings, surmounted by its gilded roofs and set in almost park-like surroundings of trees and meadows, with snow-capped mountains on all sides and the Kyi-chhu, the River of Delight, running clear in many channels through groves of willow or poplar.

It is indeed a fitting shrine for the heart of any religion, and with such surroundings it is difficult to understand how the present form of Buddhism (Lamaism), as practiced in Tibet, could ever have sunk to the depths of degradation it has reached. It is devoutly to be hoped that some reformer may arise to cleanse it of its many superstitions and to reinstate the simple tenets of its founder.

A DISAPPOINTING INTERIOR

But the interior of the Potala is curiously disappointing, as it consists principally of a mass of dark passages and cells, a certain number of halls and flights of steps.

Among the larger halls were several striking ones, especially that in which was the gilt tomb of Nag-wang-Lob-sang Gya-tsho; the dome of this hall extended upward through several stories. On the tomb there was a great deal of metal ornamentation and the whole formed a fine piece of work. On each side of the principal tomb were similar ones of smaller dimensions, those of Dalai Lamas less notable.

In another room of fairly large dimensions the walls were lined with shelves from floor to ceiling, each shelf closely packed to its uttermost extent with images of Buddha. There must have been thousands of all metals—gold, silver, copper, brass—and many were of very beautiful workmanship. In another chapel there were hundreds of golden butter lamps.



THE GATEWAY TO LHASA

Photograph by John Claude White

The entrance or doorway into Lhasa passes through the *chorten*, or shrine, in the center of the picture, which is locally known as the Pargo Kaling. Remark the strings of bells hung on either side of the *chorten*. The darker portions of the Potala are the temple buildings and are colored madder-red, with the golden roofs appearing above.

It would be quite impossible to give even a semblance of a plan of this conglomeration of buildings, and it would take weeks, perhaps months, to visit every part of the enormous structure, capable of holding thousands of people. The Treasure House was said to be full of gold and jewels at the time of our stay; but we had no opportunity of inspecting it, nor did we see the Dalai Lama's private apartments, in the northeast corner of the building, as we were particularly asked by the Tibetans not to enter this part of the building and of course did not do so.

IMPOSING LANDSCAPES

From the flat roofs of the Potala the whole valley lies mapped out below—the town to the east, a mass of low, two-storied, substantially built houses interspersed with temples; the Jo-Khang, the most holy shrine in Tibet; the Chagpori, or school of medicine; the Turquoise Bridge (Yutok Sampa), so called on account of its green-blue tiled roof; the many channels of the River of Delight (the Kyi-chhu), beyond which lies the Arsenal, and to the north the Monastery of Sera under the hills, containing 5,000 monks (see page 281). Further on the Debung Monastery, with 10,700 inmates; the gilded roofs of the Na-chung-chos-kyong (see page 286); and the Ling-Kor, the Sacred Road (see page 288), along which all devout Buddhists prostrate themselves in the hope that all their earthly sins may be forgiven, could be seen in places.

PICTURESQUE PRIESTS

There are monks everywhere in or near Lhasa. The three large monasteries of Sera, Debung, and Gah-dan alone contain about 20,000, and with all the other temples and monasteries the number cannot fall far short of 30,000, while the lay population of Lhasa only amounts to about 15,000, of whom 9,000 are women, who, strange to say, carry on practically the whole of the trade done. The remaining 6,000 males are about 3,000 Tibetans and 3,000 foreigners—Chinese, Nepalese, Kashmeris, etc.

The monks are very picturesque in their somber red robes, perhaps not quite so much in evidence in the town itself, as there there is more bustle and life and people are more occupied with trade than with the saving of their souls. The streets are full of laden animals, bringing in the every-day supplies, and caravans arriving from Mongolia and eastern Tibet. The people look well and cheerful and the town is not nearly so dirty as might be expected.

Of the other buildings in Lhasa, the School of Medicine, situated on a smaller hill on the same ridge as the Potala, stands out prominently. There is very little of interest connected with it, and the inmates or students hardly knew even the names of common useful herbs.

One of the prettiest spots in all the valleys was the Lu-Kang Garden, where there is a beautiful pool of water surrounded by lofty trees and willows half concealing an island in the center.

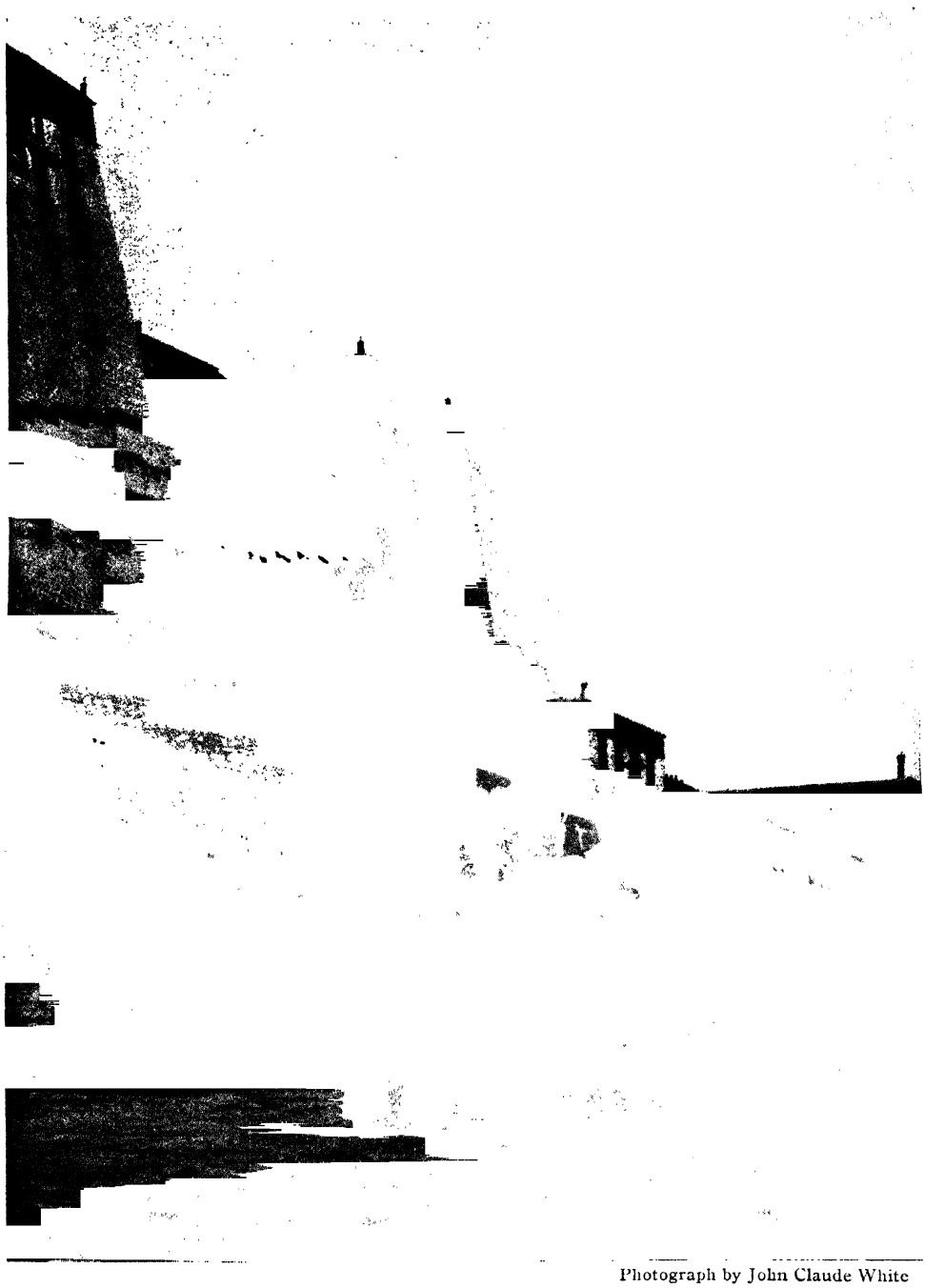
The legend runs that the island is the abode of a snake, which must be propitiated or the waters of the underground lake which lie beneath the Jo-Khang will overflow and submerge Lhasa. Doubtless the legend is founded on the fact that water lies close under the city and no well need be sunk more than 6 feet to reach the water level. When I visited the gardens the clear, brown water was extremely peaceful and reflected with added effect the beautiful coloring of its surroundings.

The quarter of the beggars, scavengers, and outcasts showed in what extraordinary hovels these people can and do live. Many of the walls of the huts were built of yaks' horns set in mud, and I need hardly say were most insanitary.

THE TURQUOISE BRIDGE OF LHASA

Not far from the Cathedral is one of the sights of Lhasa, the Turquoise Bridge, so called on account of the lovely coloring of the green blue tiles of the roof. Encircling the buildings is the Sacred Road, merely to walk along which absolves the mortal from all earthly sins, and many pilgrims prostrate themselves for its entire length, thus securing everlasting happiness in their future life.

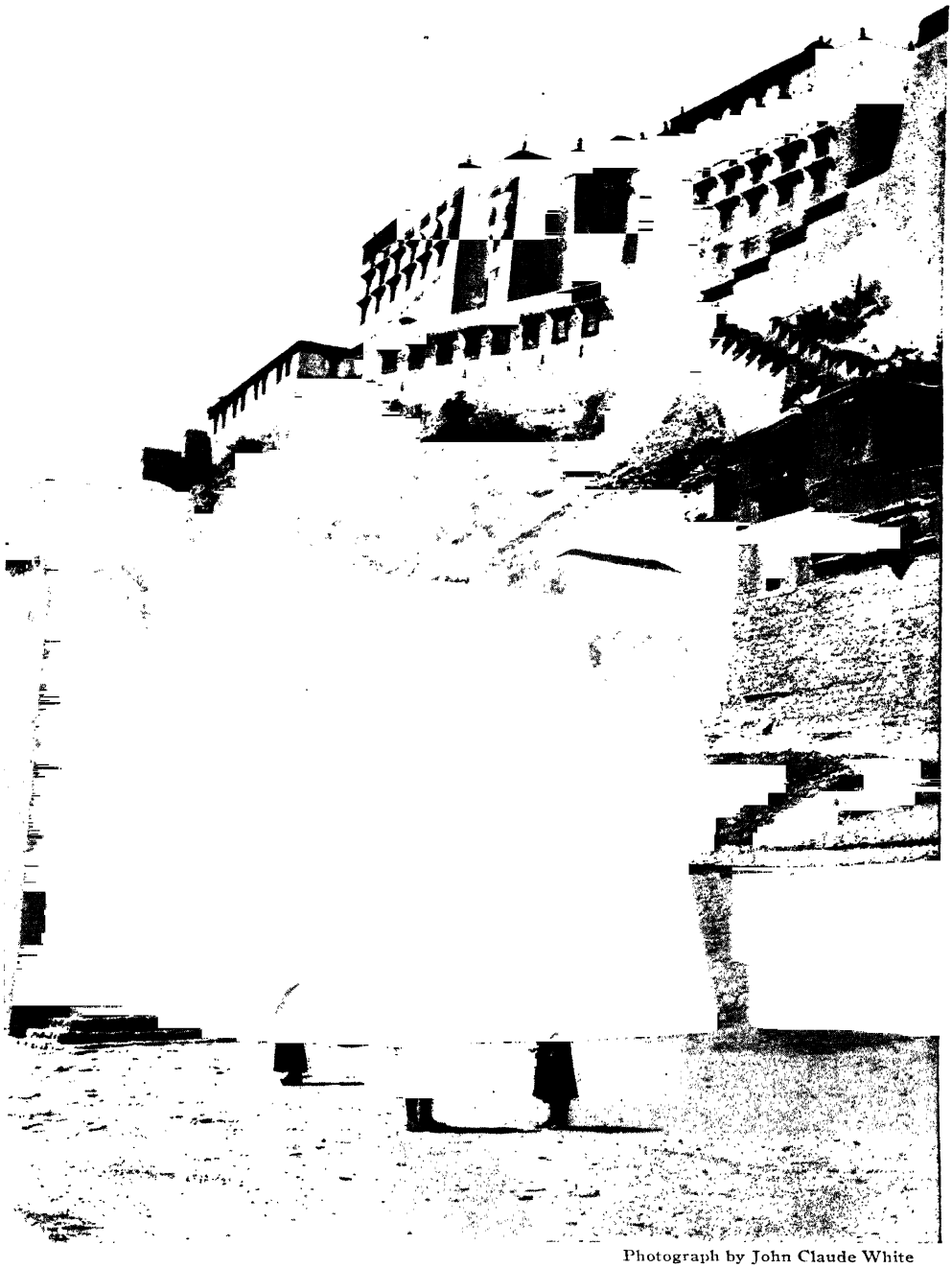
The most interesting portion of the Sacred Road is where it nears the Kyi-chhu and runs through some sharp lime-



Photograph by John Claude White

VIEW TAKEN FROM ONE OF THE COURTYARDS OF THE OFFICES ATTACHED TO THE POTALA

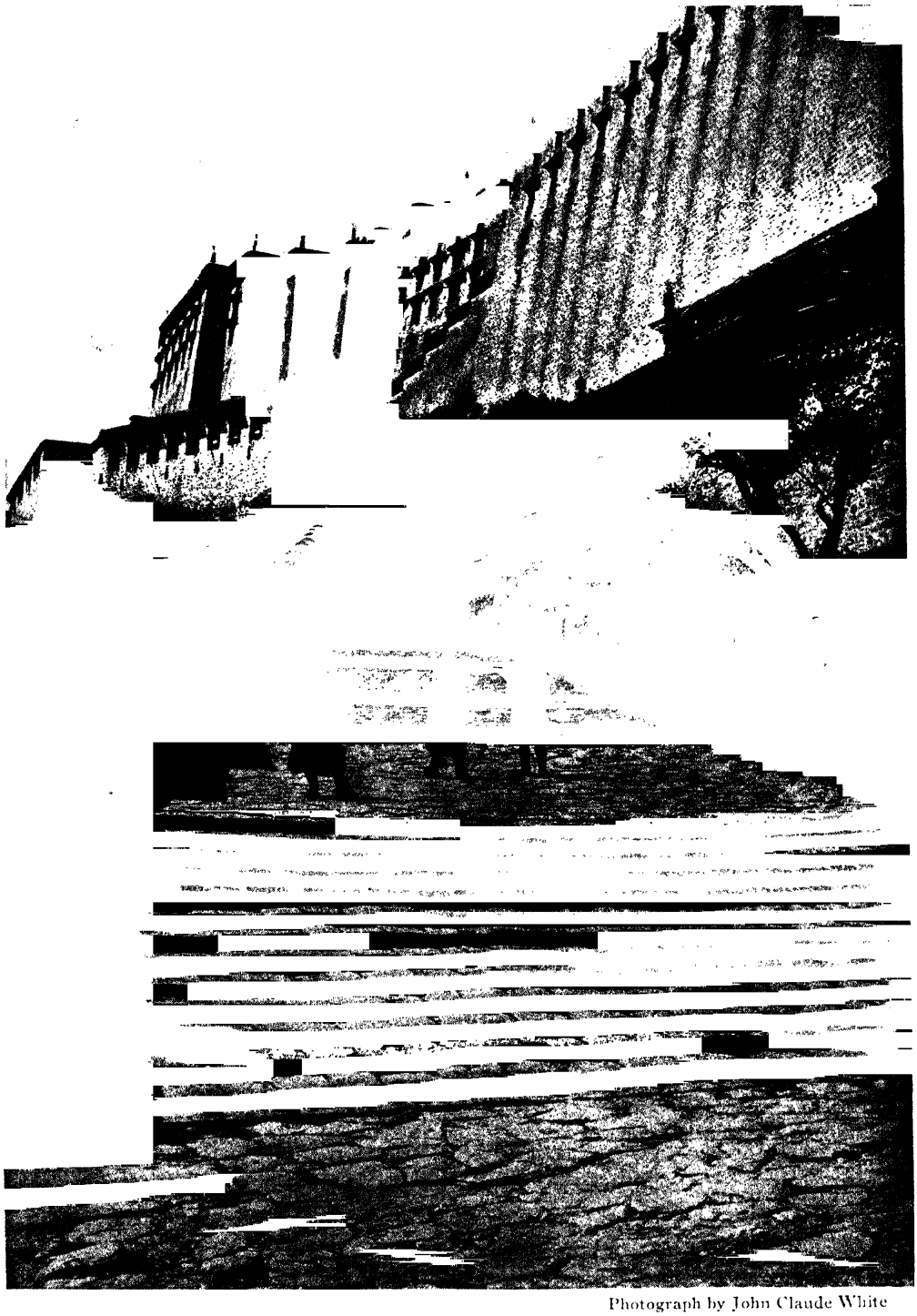
"It is indeed a fitting shrine for the heart of any religion, and with such surroundings it is difficult to understand how Lamaism could have sunk to the depths of degradation it has reached" (see text, page 273).



Photograph by John Claude White

THIS VIEW GIVES SOME IDEA OF THE HEIGHT OF THE POTALA. THE DOORS IN THE CENTER ARE THE ENTRANCE TO SOME OF THE OFFICES.

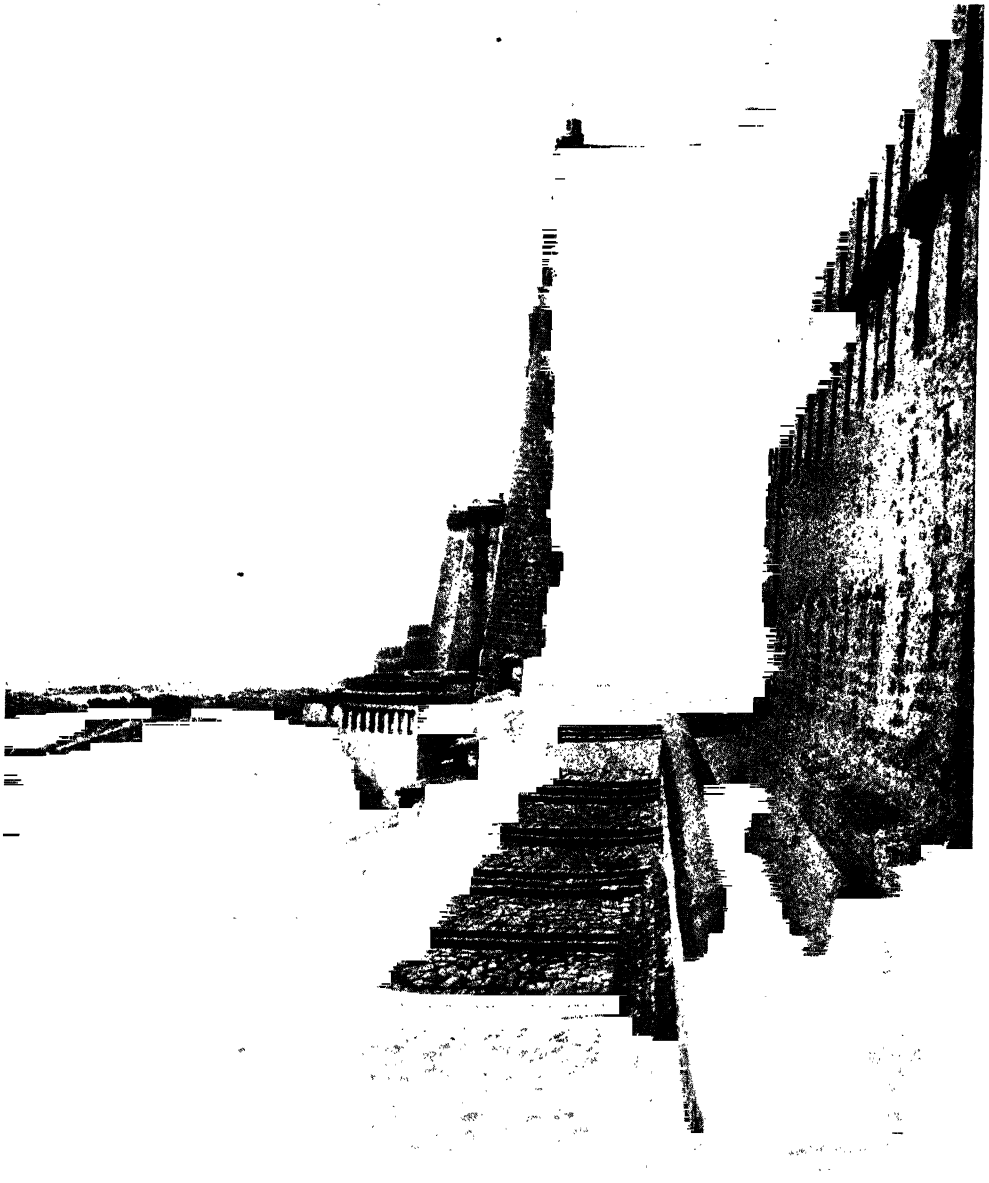
"The Potala dominates everything in Lhasa. The enormous mass of buildings, partly monastery, partly palace, and partly fortress, is built on a rocky ridge which stands out in the center of the valley, commanding the town and dominating the whole situation. Its architecture is magnificently grand, bold in outline and design; it towers above everything, with its gray white walls and buttresses, its immense flights of steps and terraces dotted with red-robed monks ascending and descending from religious ceremonies" (see text, page 273).



Photograph by John Claude White

A FLIGHT OF STEPS ON THE SOUTHWEST SIDE OF THE POTALA

This structure "is set in almost park-like surroundings of trees and meadows with snow-capped mountains on every side, and the Kyi-chhu, the River of Delight, running clear in many channels through groves of willow or poplar" (see text, page 273).



Photograph by John Claude White

AT THE TOP OF THE MAIN FLIGHT OF STEPS, SHOWING THE TERRACE LEADING TO THE MAIN ENTRANCE

This picture also shows the yak's-hair curtains hung to protect the painted carving on the entrance



Photograph by John Claude White

PRAYER FLAGS STRETCHED ACROSS AN ARM OF THE KYI-CHHU TO AN ISLAND

"All devotees, men and women, walk, always turning a small hand prayer-wheel, filled with minute prayers, printed on thin paper; and larger prayer-wheels, filled in some cases with tons of paper prayers, are set revolving by the devout, or are sometimes worked by water-power. Smaller ones are turned by the hot air rising from butter lamps" (see text, page 271).

stone rocks, carved deeply with figures of Buddha cut into the rock and painted in many colors (see pages 280 and 288).

From the rocks prayer flags are suspended on lines running to an island in the river. These prayers are universal in Tibet, and so long as they are moving they are recording prayers for the benefit of those who put them up. All devotees, men and women, walk, always turning a small hand prayer-wheel, filled with minute prayers, printed on thin paper; and larger prayer-wheels, filled in some cases with tons of paper prayers, are set revolving by the devout, or are sometimes worked by water-power. Smaller ones are turned by the hot air rising from butter lamps.

THE FAITH OF THE LAMA

Single prayers, printed on thin cloth, are strung vertically on poles or stretched across open spaces to flutter in the wind and thus send millions of prayers vibrating toward the Omnipotent for the benefit of some one's soul. They are most picturesque An old Lama I once questioned on the subject told me "that if the person turning the wheel truly believed that by doing so he was accumulating merit, it would certainly count as a meritorious action."

The three great monasteries round Lhasa, Debung, Sera, and Gah-dan, known as the Sen-de-gye-sum, exercise very considerable power.

I was asked to visit two of these monasteries—Sera and Debung—by special invitation of the Lamas, a very great honor, which I thoroughly appreciated, and I felt highly flattered to find myself known to these Tibetan monks as a result of my intercourse with their coreligionists during the years I had spent in Sikhim.

Debung, with its huge Lama population, is like a small town, with streets, alleys, and temples. The streets are steep and paved with granite blocks and the alleys are narrow and dark, and were filled with crowds of monks surging up to see the foreigner. My attendant Abbot, accompanied by lictors with large, heavy whips and under-Lamas carrying iron maces with heavily embossed copper plates ornamenting the sides, had considerable difficulty in keeping order, and the lash of the whips resounded as they laid on with no light hand to those who did not obey orders.

The Head Abbot and Lamas were in every way superior to the vast crowd of lesser monks, many of whom were of a very low type and standard generally, and they looked a villainous and truculent lot, who, I fancy, require a rule of iron to keep them in any kind of order.

I was entertained at each of the four sections of the monastery with a repast of tea, dried fruits, sweets, and murwa (a kind of beer), and I was shown several of the Lamas' cells, which, though small, were quite clean and tidy, and had each a window. The monastery has a bad reputation for lawlessness and in it all manner of plots are hatched and much wickedness goes on.

By far the most charming of the monasteries near Lhasa is that of the Chief Oracle and Magician, the Ne-chung-chos-Kyong. It lies in a small valley near Debung, with a good supply of water, and is consequently surrounded by beautiful groves of trees and lovely gardens with streams running through them. Coming upon it in the midst of a sandy plain enhances the charm of this delightful spot, and the relief it is to leave the glare and dust for its cool, shady walks.

A TOUCH OF ITALY IN TIBET

The entrance takes one through a street with houses on either side, Italian in coloring and style, and then up many steps to the principal gate. Passing through the gateway, the green luxuriance of leafy trees is in striking contrast against the whitewashed walls of the houses and the madder red of the temple itself, with the brilliant coloring of its doorways and pillars and the gold of the fantastically shaped roofs glittering in the blazing sunshine against a clear blue sky, with lines of prayer flags fluttering in every direction.

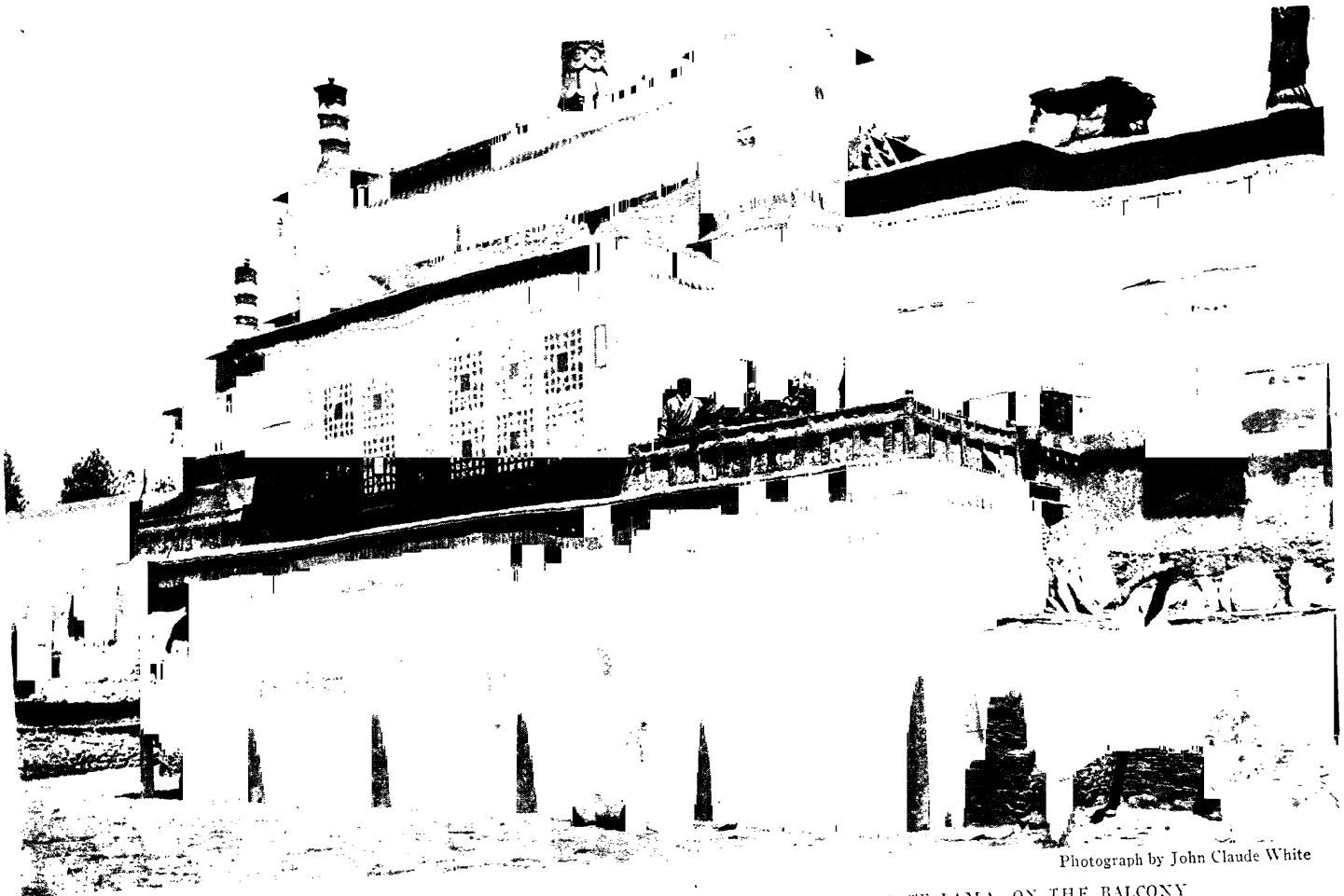
Turning up a flight of steps, the main temple is reached, passing on the way through a cloistered courtyard and a corridor supported by carved and decorated pillars, hung with ancient arms, leading



Photograph by John Claude White

A FINE ROW OF CHORTENS ON EACH SIDE OF THE ENTRANCE TO LHA-LUNG MONASTERY: TIBET

Animal life was not very plentiful, but there were fairly large flocks of burhel (*Ovis nahura*) and a good many nyen (*Ovis ammon*) on the higher hills, and in the eastern districts I came across hundreds of the latter, as tame as ordinary sheep. On the plains Tibetan gazelle and wild asses were occasionally to be seen, but not in great numbers. The wild ass is a graceful creature of a red-brown color, with black markings and points, and very inquisitive. A herd would circle round for hours, keeping well out of range, but offering splendid opportunities for observation. There was an occasional wolf or red fox to be met with and a few Tibetan lynx. Hares abounded and large colonies of both the small and greater marmot, and in some places at the foot of the hills a good bag of partridge could be had. These, with a few Tibetan sand grouse, made up the total, though in the autumn the lakes were crowded with duck and geese. The wild birds were interesting, and there was one species which built its nest in the same burrow as the small marmot, with whom they lived on very friendly terms.



Photograph by John Claude White

COURT OF THE LHA-LUNG MONASTERY, WITH THE AVATAR, OR INCARNATE LAMA, ON THE BALCONY



Photograph by John Claude White

INTERIOR OF THE LHA-LUNG MONASTERY, WITH GROUPS OF LAMAS

The number of monks in Tibet is said to be very large, nearly 500,000 housed in 1,026 monasteries, and this out of a population of about three and one-half millions is a very large proportion and affects very adversely the country's material progress.

up to the principal doorway. Behind great hangings of black yak's hair, to screen them from the sun, are the magnificently carved doors, brilliantly colored in carmine and vermilion.

Peace reigns, the courtyard is full of flowers, and everything is quiet and orderly, conducive to the meditation which forms so large a part of the Buddhist religion.

Entering the great temple itself through the wonderful doors and passing through it, the Inner Sanctuary was reached. In it was the Golden Throne of the Chief Oracle, and on it lay his Robes of State, Sword of Office and Shield, and on all sides were the jeweled paraphernalia required for ceremonial processions and dances, so essential to Lamaism. It was evident great care had been bestowed on them, and they were specimens of beautiful workmanship and adorned with many really fine turquoise. One in particular, a circular "Mirror of Purity" of polished silver, set in copper gilt repoussé work, ornamented with turquoise, was exceptionally good.

THE MAGICIAN'S PRIVATE DWELLING

Leaving the temple and courtyard, we ascended to other temples, all elaborately decorated and beautifully kept, and then went out on the roof immediately below the Golden Roof for a nearer inspection of it and its exquisitely designed dragon-head finials. We next visited the magician's private dwelling-house, situated at the back of the main temple in a beautiful miniature garden, in which bamboos, hollyhocks, nasturtiums, stocks, and roses were all growing luxuriantly, watered by a tiny stream of clear water.

The windows were protected by delightful white awnings, and inside everything was scrupulously clean, the floors and woodwork so highly polished one felt one should do as in Japan and remove one's boots, and the walls charmingly decorated with fresco painting.

The religion inculcated by Buddha had certain cardinal points—the encouragement of the ascetic life, the maintenance of virtue, the exhortation to persons of all castes and both sexes to aim at deliverance from the evils of existence, and lastly the attainment of Nirvana.

But in Tibet Buddhism has been grafted onto the earlier devil worship of the people and a religion has been evolved better expressed as Lamaism, or modified devil worship, so that in addition to the Buddhas and Bodisats there have also come to be Tutelary and Guardian deities of a terrifying and malignant aspect, whose duty it is to defend the faith and the faithful people from external attack. These deities are depicted in grotesque and terrible forms in all the monasteries, generally in violently colored fresco paintings at the entrance.

CREDULOUS PEASANTS

The credulous peasants, steeped in superstition, look up to and pray to these monstrosities for their deliverance from evil, from the lures and persecutions of the demons and sprites, by which every Tibetan regards himself as surrounded.

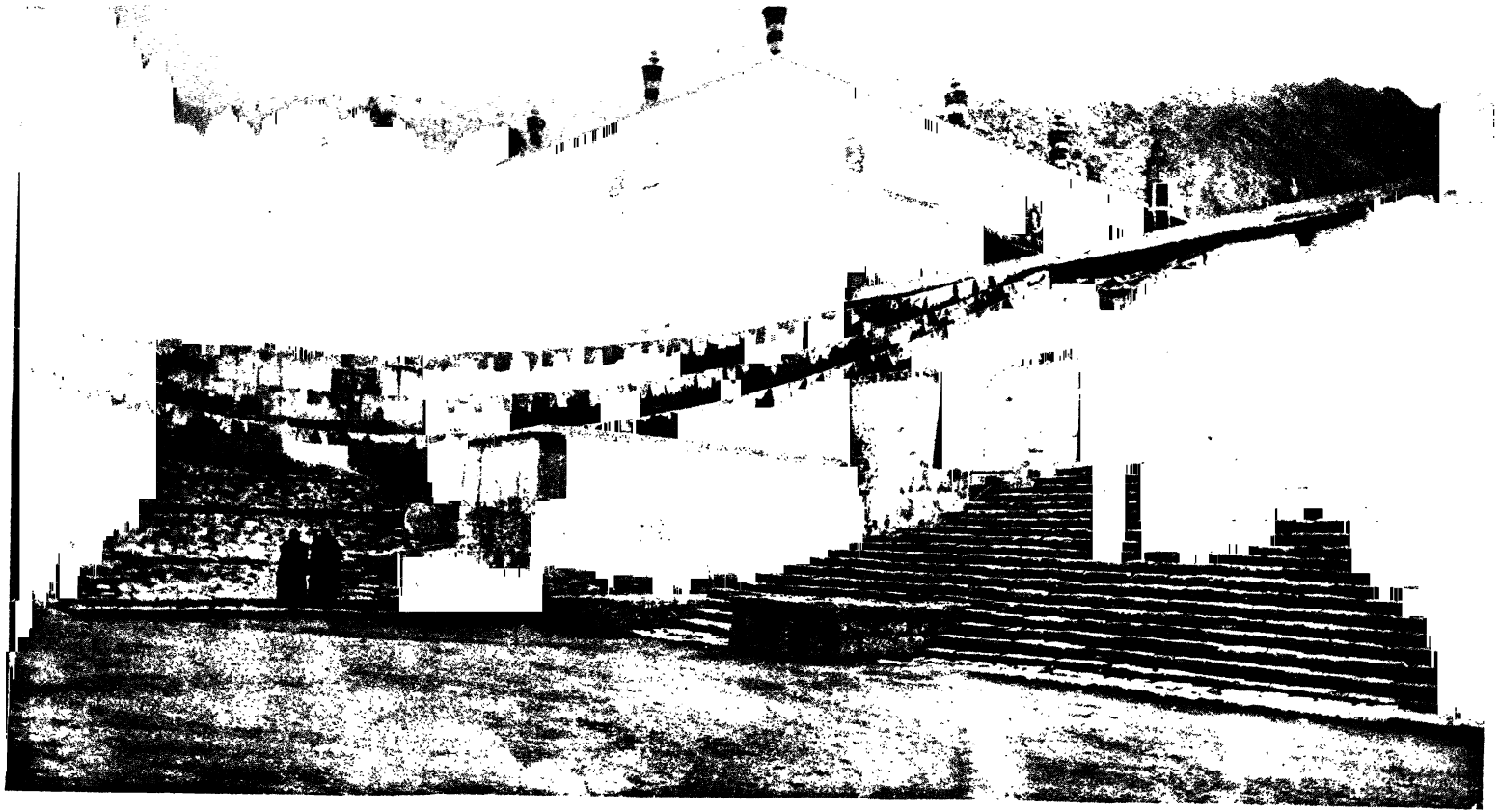
The common folk believe, too, in mischievous and malignant gods, some in the shape of gnomes, some hobgoblins, others with such long slender necks and small mouths they can swallow nothing, and in their attempts writhe to such an extent their struggles cause earthquakes. Another belief is that rainbows are formed by innumerable sprites, or small folk, sliding down into water, sprites who live only on smells and twang guitars as they slide; and that drinking the water will give fever. Others living on the tops of hills or passes send down avalanches and give travelers mountain sickness, and perhaps the most dreaded of all are the "shri," who attack children.

All these beliefs are more or less the religion of the common people, combined with the hope of being perhaps reincarnated into a higher sphere and of ultimately being admitted into Nirvana.

CHARMS COULD NOT STOP NICKEL BULLETS

Tibetans have absolute faith in charms protecting them from all dangers and evils, and once during our stay when a prisoner was being treated for wounds and was asked how he, having the requisite charms from the Lamas, could have been wounded, answered that he had no charm against a nickel bullet, such metal being unknown to the Lamas.

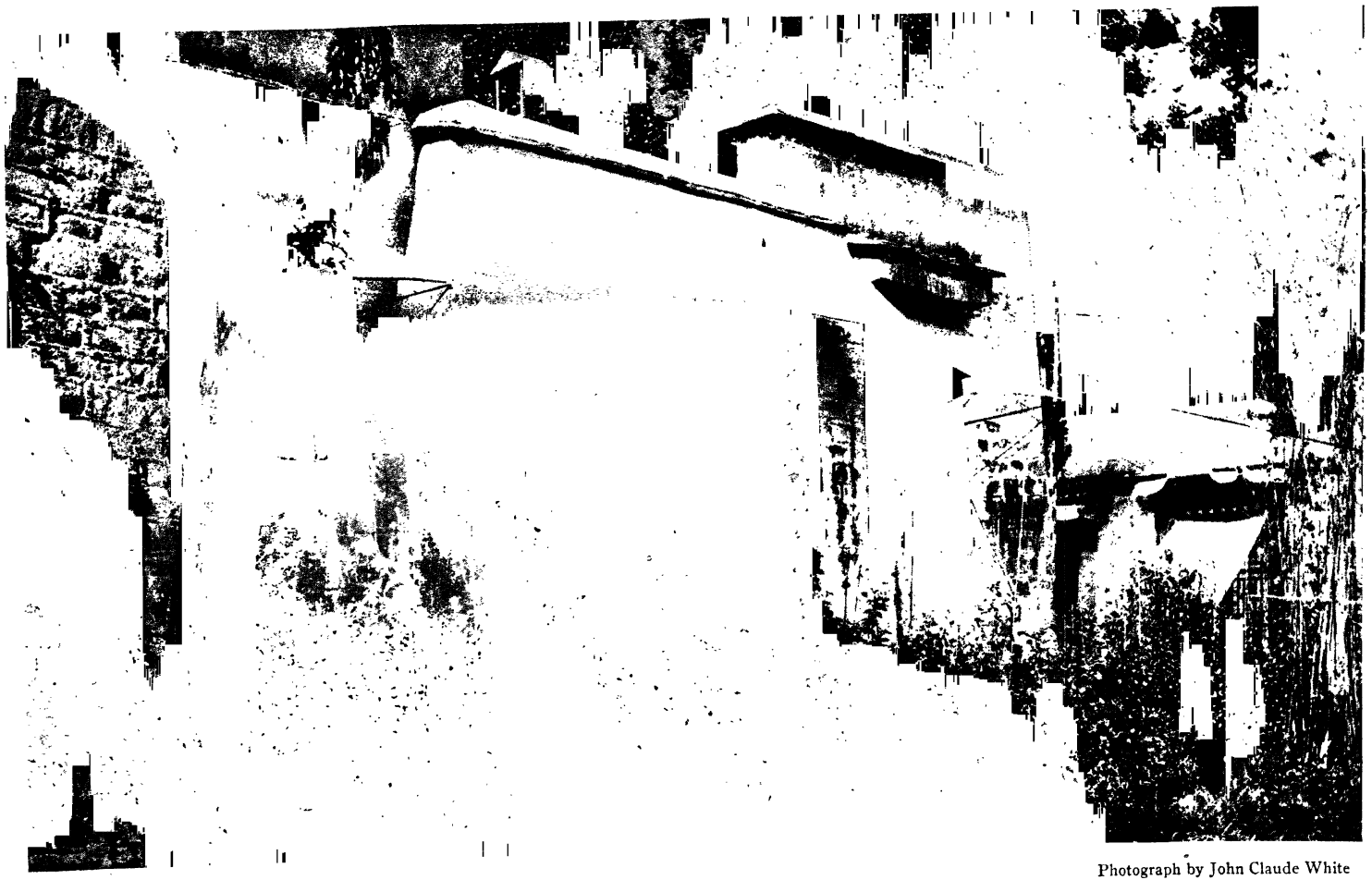
They are strictly forbidden to take life.



Photograph by John Claude White

A COURTYARD IN THE NACHUNG MONASTERY, WITH LARGE NUMBERS OF PRAYER FLAGS HUNG ACROSS THE COURT: THE UPPER PART OF THE TEMPLE IS COLORED MADDER-RED

It lies in a small valley near Lhasa, with a good supply of water, and is consequently surrounded by beautiful groves of trees and lovely gardens with streams running through them. Coming upon it in the midst of a sandy plain enhances the charm of this delightful spot, and the relief it is to leave the glare and dust for its cool, shady walks.



Photograph by John Claude White

THE CHIEF ORACLE'S PRIVATE APARTMENTS IN THE NACHUNG MONASTERY

The windows are shaded by picturesque white awnings and the garden is full of flowers. The golden roofs are very fine. Around them hang numerous bells, which ring with every movement of the wind.



Photograph by John Claude White

CARVINGS ON THE LIMESTONE ROCKS ON THE LING-KOR ROAD: LHASA

These are all brilliantly colored and nearly all representations of Buddha (see page 275)

The Tibetan believes that any failure on his part to acquire merit in this world will not result in immediate punishment, but in a never-ending repetition or reincarnation in some form or other of life in this world, when his struggles will commence over again.

Their religion teaches men to attend only to their own salvation; it teaches nothing of any duty to the State or to the well-being of the community and leads to the deterioration of the nation as a whole.

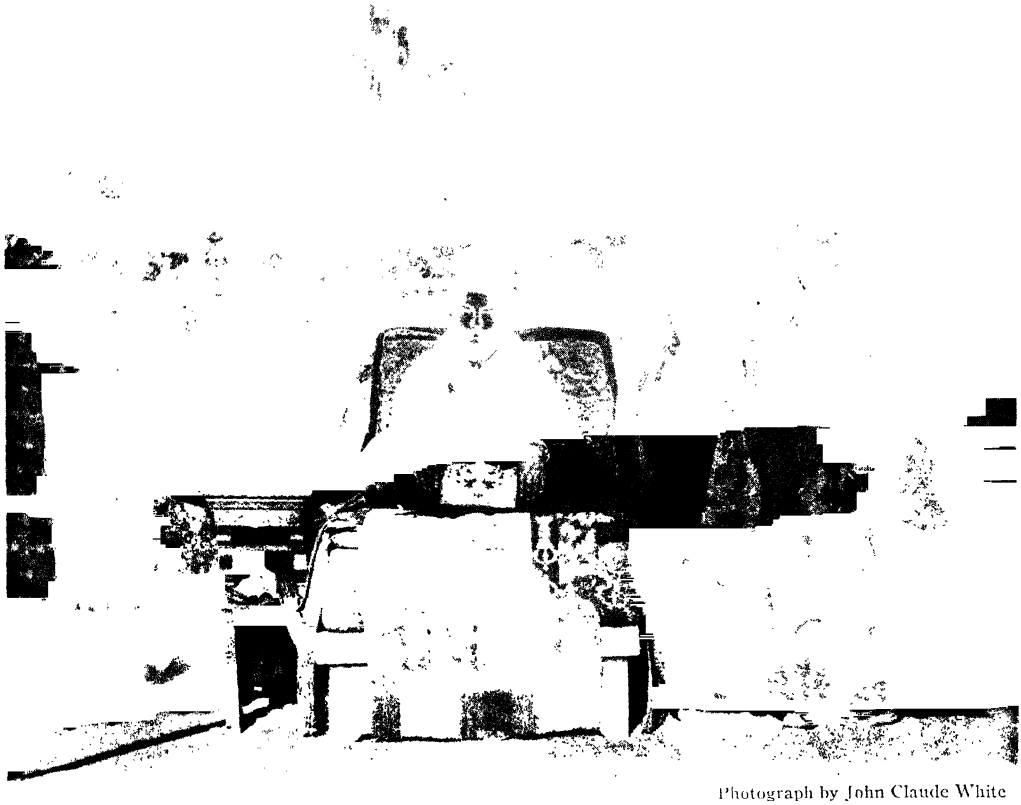
It is the usual custom for the eldest son of the family to enter a monastery, and sometimes more than one son takes to the religious life. In addition to being considered an honorable profession, it is an exceedingly lazy life and appeals to many. They are required to do nothing, while they are clothed, housed, and fed at the expense of the State.

Many of the monasteries are supposed to have schools, but they are of no use and teach nothing of any practical value. All kinds and conditions of men are admitted and the result is not satisfactory, as the bulk of those I saw in the large monasteries were a degraded and in many cases a bestial lot.

ONE-SEVENTH OF THE PEOPLE ARE MONKS

The number of monks in Tibet is said to be very large, nearly 500,000 housed in 1,026 monasteries, and this out of a population of about three and one-half millions is a very large proportion and affects very adversely the country's material progress.

The Tashi and Dalai Lamas never die,



Photograph by John Claude White

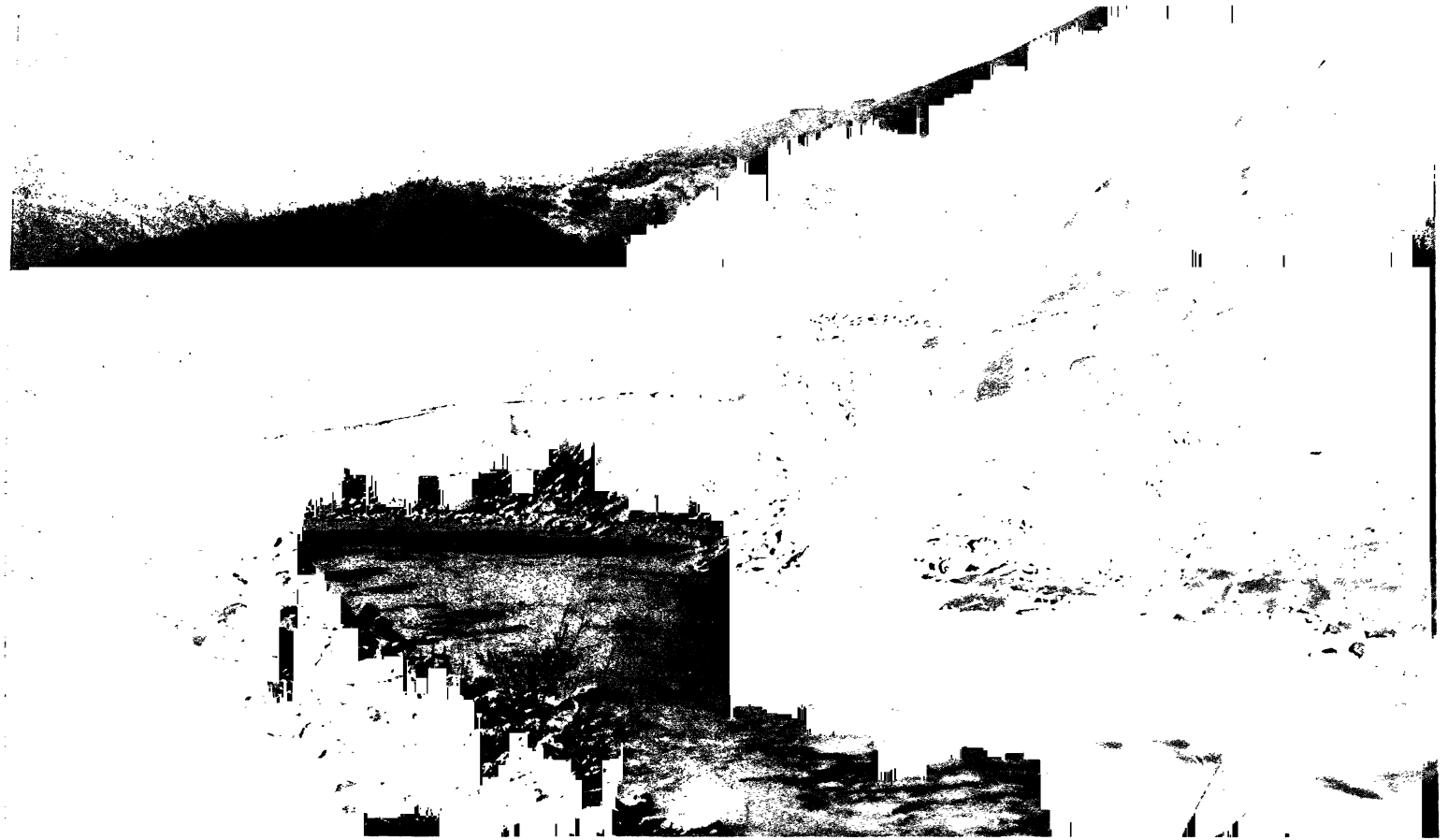
A PORTRAIT OF THE TASHI LAMA WITH HIS MINISTERS AND FOLLOWERS

as their souls on departing the life are reincarnated in the body of some infant, who by some miraculous sign, such as the recognition of a rosary, an article of clothing belonging to the deceased, or something of that sort, establishes his claim.

Mr. Wilton tells us how the Chinese manipulate the selection to insure the chosen candidate belonging to the pro-Chinese faction. When the choice has been narrowed down to four, four fish-shaped tablets are publicly placed in a golden urn, the gift of the Great Manchu Emperor Kienlung. The name inscribed on the first tablet drawn is hailed as the Dalai Lama, and it is the custom to solemnly recommend him for confirmation to the Chinese Emperor by the Amban.

Kienlung's method of choice of a Dalai Lama was intended to prevent a selection likely to be detrimental to Chinese interests, and this is how it was carried out: The selection of the infant was left entirely in the hands of the Tibetans; only the final putting in of the four fish tablets was superintended by the Tibetan Regent and the Chinese Amban. The actual drawing was done by a Tibetan; but to insure the right candidate, all four tablets were inscribed with the same name.

The last four Lamas—ninth, tenth, eleventh, and twelfth—have all died before attaining their majority, 18 being the age of majority for a Dalai Lama. It was prophesied in Lhasa ten years before the present incumbent's selection, in 1876, that he would be the last of the Dalai Lamas, and, as events have turned out in China during the last few years, it is more than likely we shall not see another.



Photograph by John Claude White

A VERY GOOD EXAMPLE OF THE CANTILEVER PRINCIPLE AS APPLIED IN THIS PART OF THE WORLD (TIBET)

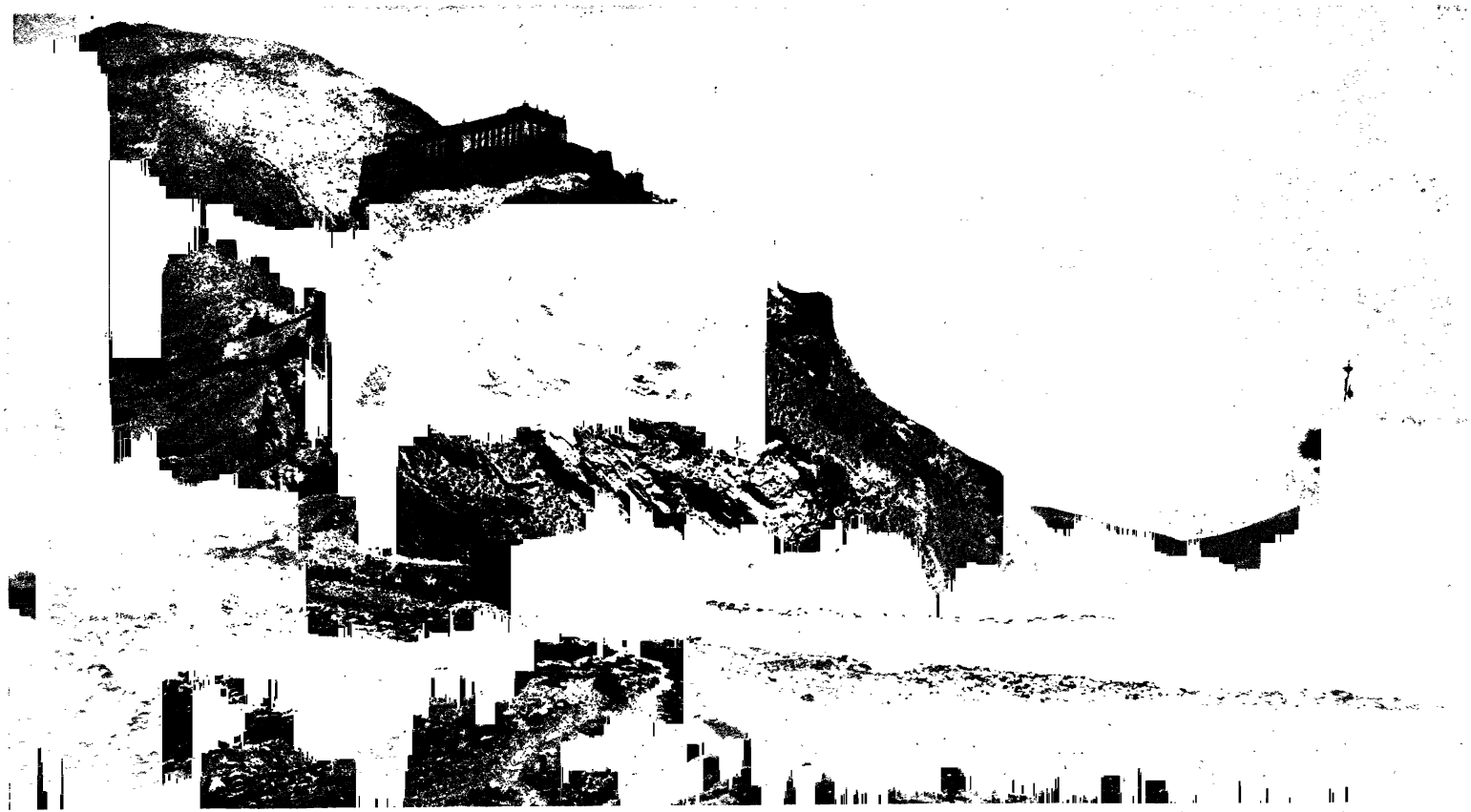
The hills in the background are those crossed by the Jeylap-la and Natu-la passes. Both of these passes are over 14,500 feet and very difficult, espe cially in winter, when they are often blocked for days together by deep snow.



Photograph by John Claude White

SOME OF THE NUNS OF THE TA-TSHANG NUNNERY

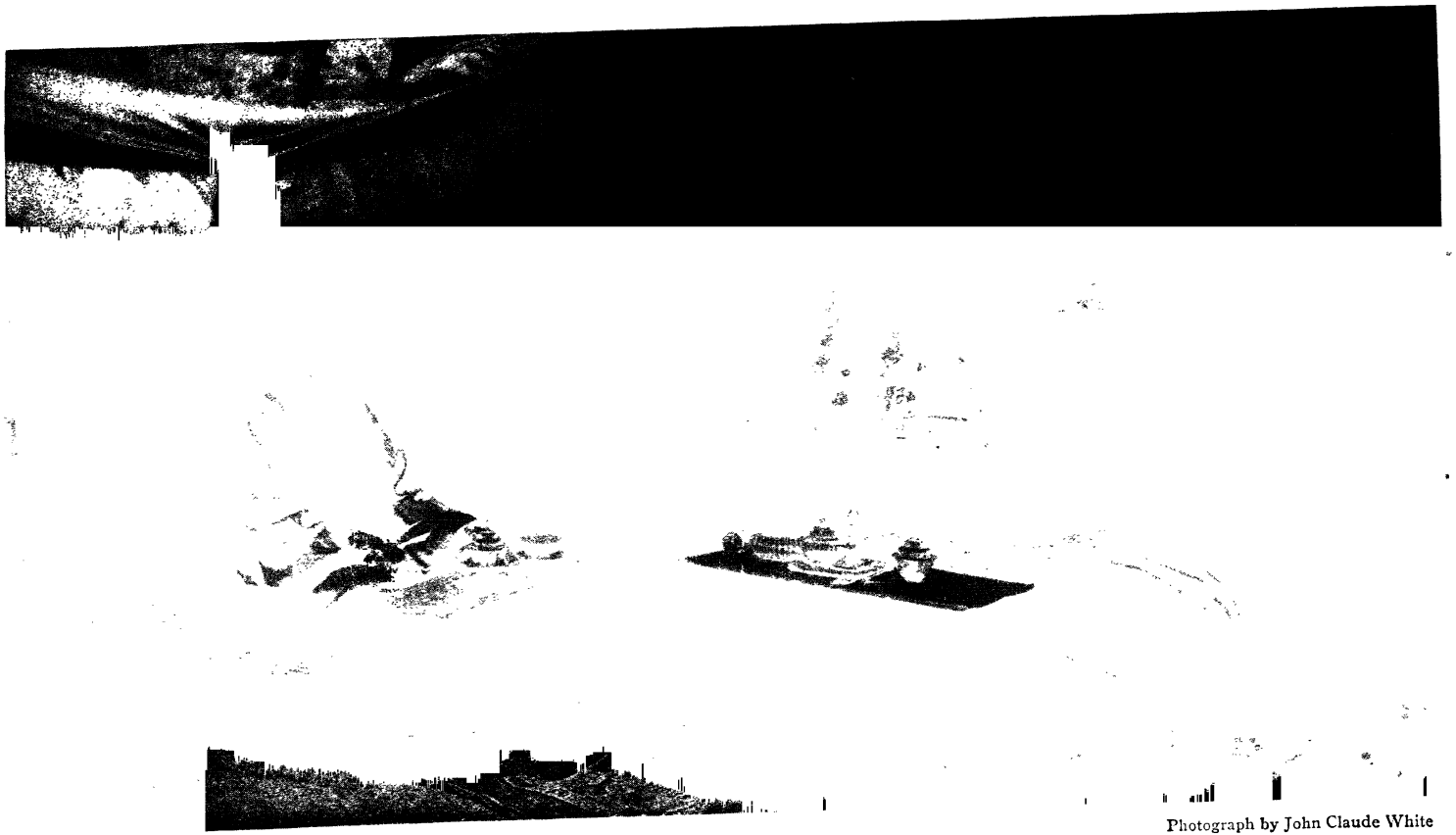
Their head-covering is made of sheep's wool. Carved on the stones is the sacred formula, "Om-mani-pade-hum" (Oh, the Jewel in the Lotus). Not very far from Khamba Jong was the nunnery of Ta-tshang, situated in a most dreary spot, with not a single habitation in sight; and in winter it must be a terrible place, wind-swept in all directions except the north. The nuns, however, seemed quite happy and contented, though they are the dirtiest lot of women I have ever seen, and after visiting the interior of the building and seeing the refectory we were thankful to be in the open air again.



Photograph by John Claude White

A FINE SPECIMEN OF A TIBETAN FORT: TUWA JONG AND MONASTERY

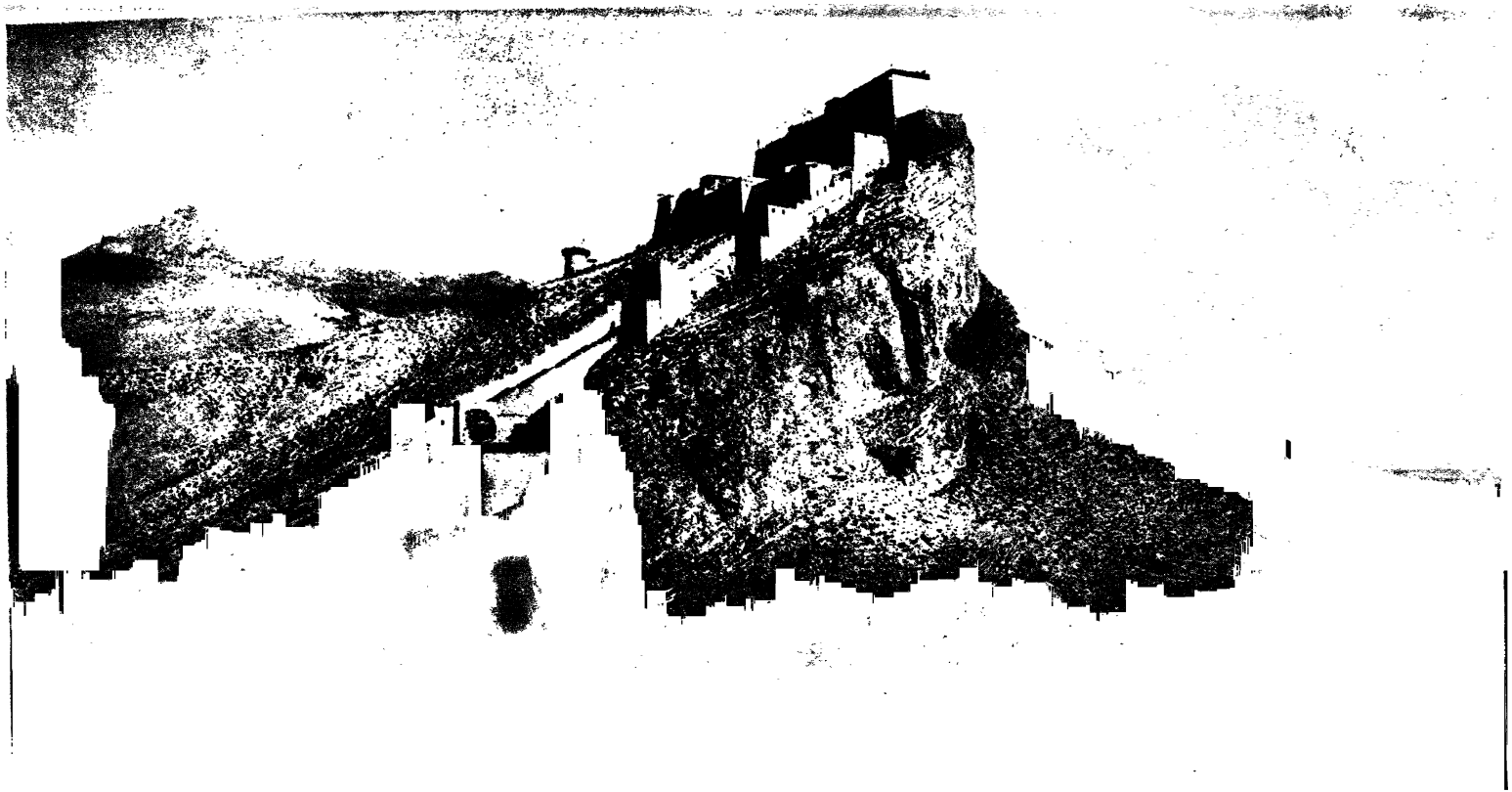
The trees here are willows. The power of the sun is so great in this clear atmosphere that at the present day, at the height of 15,780 feet, barley ripens in irrigated fields along the southern slopes of the limestone hills on which the fort is built, and in a sheltered corner below the jong there are very old willow trees with gnarled and twisted trunks; a few miles away, in some sandy hills, there is quite a forest of juniper with trunks, though stunted, running to 18 inches in diameter. Another marked and common feature in some of these elevated wind-swept plains are the bright yellow sand-hills, which are almost all crescent-shaped and at right angles to the prevailing wind, many of them rising 80 or 100 feet in height in the center.



Photograph by John Claude White

THE SHIGATSÉ ABBOT IN HIS TENT AT KHAMBA JONG

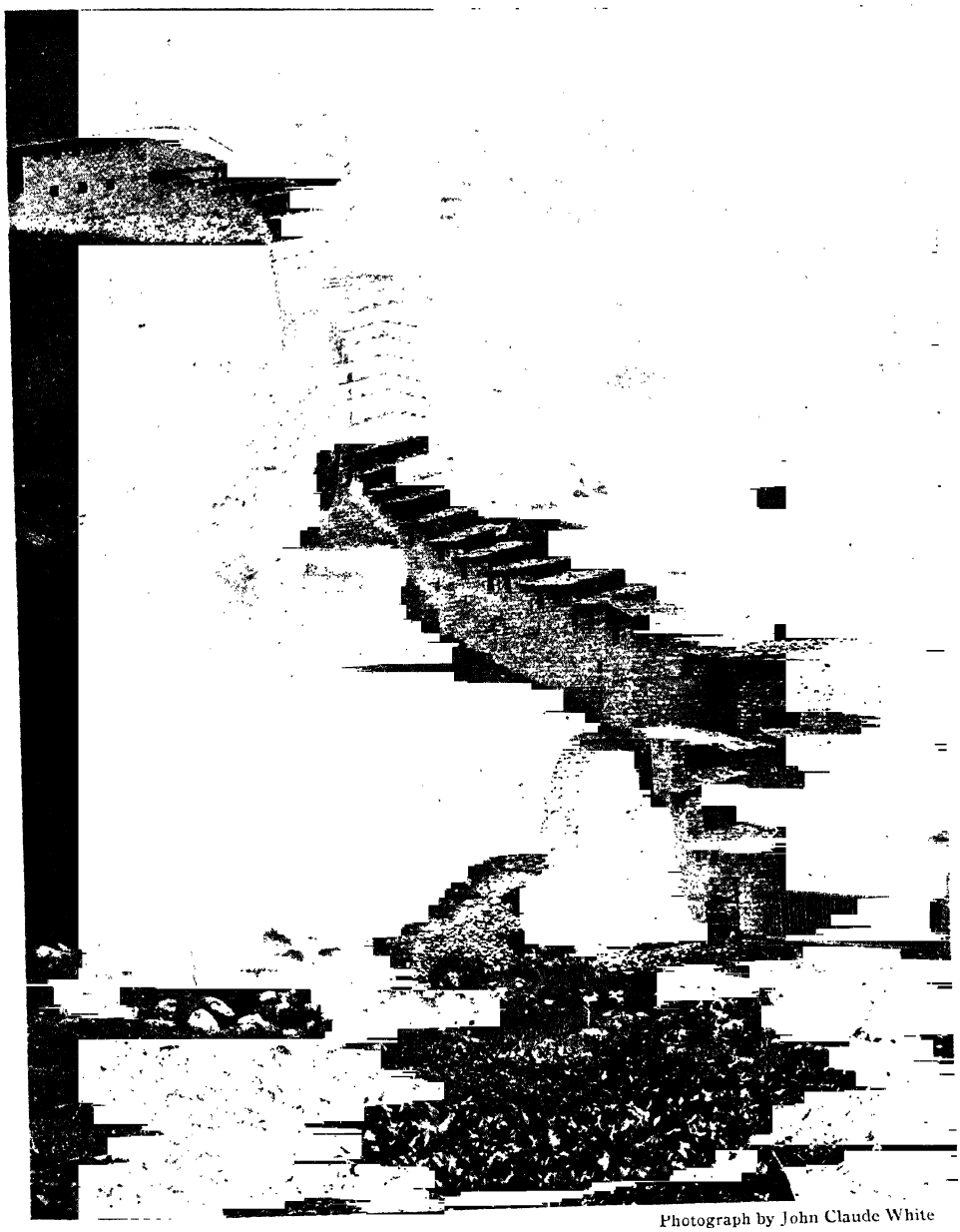
This Tibetan Abbot is the third man in importance in Tibet. He came to the camp with his secretary, who is seen seated with him. Our camp was unusual—unique, I think I may say—lying, as it did, at an elevation of 15,870 feet, higher than Mont Blanc, in an almost level plain, with a magnificent panorama of the Himalayas stretched out before us to the south; Kinchenjunga, 28,156 feet, and Mount Everest, 29,002 feet, the highest mountains in the world, distinctly visible, while behind us rose sharply the picturesque building of Khamba Jong, built on an overhanging limestone cliff.



Photograph by John Claude White

VIEW OF THE FORT OF KHAMBA JONG, BUILT ON A PRECIPITOUS LIMESTONE CLIFF AT AN ELEVATION OF NEARLY 16,000 FEET, IN TIBET, 20 MILES FROM THE INDIAN FRONTIER

The origin of the jongs, or forts, which are dotted all about this part of Tibet, is very obscure, and I could get no history of this one. The Jong-pen, or governor, evidently knew nothing, nor could he produce any old documents which could throw any light on the subject. My observations led me to believe that in the not very distant past these regions received a much larger rainfall than they do at present. With this heavier rainfall, there was better grazing and consequently a far larger population, and this is proved by the very large number of deserted villages and houses to be seen in all directions, as well as by the old water channels for carrying water to cultivated areas. There are thousands of houses in these valleys now standing empty. These forts were a necessity in more prosperious times, when the population was comparatively great, and were required for protection against raids as well as for administrative purposes.



Photograph by John Claude White

THE WALL ACROSS THE ROAD AT YATUNG, IN TIBET

We found some remarkable hot springs not far from here, the water in some cases registering boiling point. Many Tibetans congregate round these springs to bathe, and the water, which is highly charged with sulphur, is considered specially efficacious in cases of skin disease. Bathing is a simple proceeding on their part. All that is considered necessary is to scoop out a depression in the deposit round any spring, and this, filled with water, makes the bath. A tent is sometimes thrown over it, and the whole family—men, women, and children—sit for hours in the steaming water, and they certainly look a different color after a prolonged immersion, the process removing several layers of dirt.

VOICE VOYAGES BY THE NATIONAL GEOGRAPHIC SOCIETY

A Tribute to the Geographical Achievements of the Telephone

PERHAPS never before in the history of civilization has there been such an impressive illustration of the development and power of human mind over mundane matter as was demonstrated at the annual dinner of the National Geographic Society, at the New Willard Hotel, in Washington, on the evening of March 7, the fortieth anniversary of the award of the patent for the invention of the telephone to Alexander Graham Bell.

The occasion was in itself inspiring. Science, art, diplomacy, statecraft, and business had sent their most distinguished representatives to join with the Society in honoring those whose services to civilization had been so far-reaching and which were to be so dramatically demonstrated during the evening. From the four corners of the country had come a nation's elite to join with the Society in crowning with the laurels of their affection and admiration the brilliant men whose achievements had made possible the miracles of science that were to be witnessed.

And if the occasion was impressive and its setting inspiring, the events of the evening were dramatic beyond measure, for it seemed indeed that at last fact had outrun fancy, and that imagination had acknowledged the supremacy of actuality.

LATTER-DAY MIRACLES

Small wonder was it that at the evening's close the men who help guide the destinies of the nation had in subdued emotion declared that they felt "humbled and meek and overwhelmed!" What wonder that they in amazement exclaimed to one another, that in view of the things their eyes had seen and their ears had heard, "no man can say that anything is impossible!"

What wonder, indeed, was it that men declared that it might yet be possible to talk to Mars if it were inhabited; what wonder that they had come again to believe in fairies—only that these fairies were no longer creatures of the unseen world—but men with super-minds like Marconi, Vail, Carty, and Graham Bell; what wonder that men pronounced what they beheld as latter-day miracles, or that many men and women present felt that they were dining amid scenes closely bordering the supernatural!

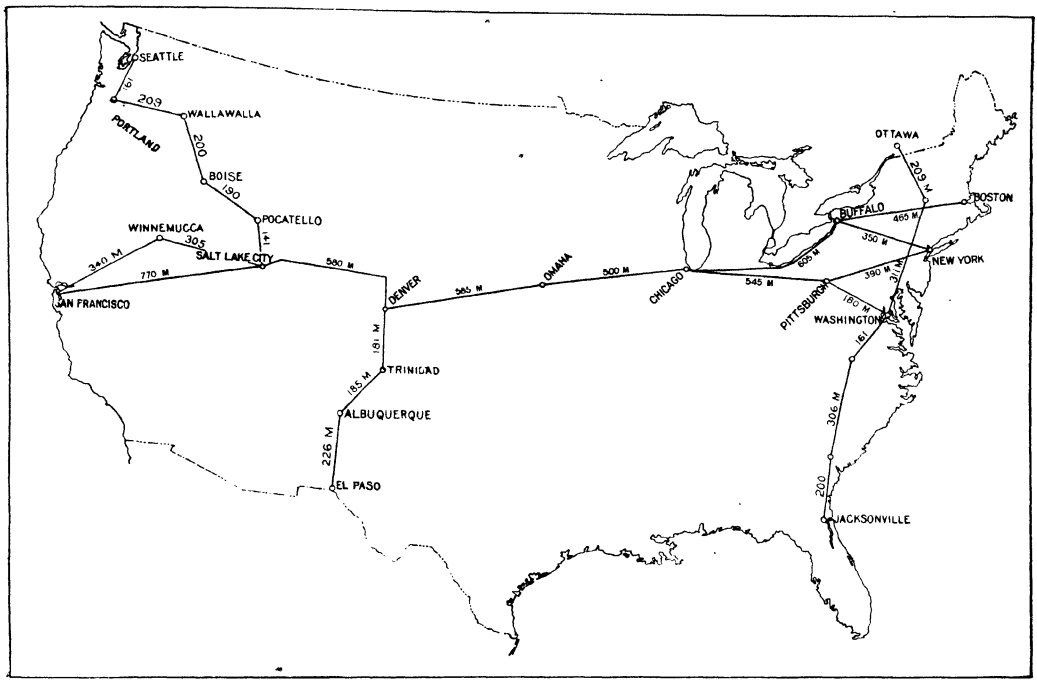
For had they not heard the living voice across a continent! Had they not had brought home to them the fact that in the twinkling of the eye their voice had swept from sea to sea, across high mountains, low plains, prairies, and plateaus!

Had they not heard the Pacific's surf beat upon its rockbound coast, while they themselves were on the very threshhold of the Atlantic!

Had they not, indeed, heard and added their own voices to the strains of the Star Spangled Banner played by a phonograph at Arlington, Virginia, and carried to New York by wireless and back to Washington by wire, in all its sweetness, with all its inspiration, and breathing patriotic faith—carried there at a speed that made the "wings of the wind" a misfit metaphor!

Think of a diner in that banquet hall hearing the strains of that music, after they had traveled four hundred miles, half way by wire and the other half by wireless, before they could reach the ear of a person at the very foot of the tower whence they started!

The dinner was given in honor of the achievements in the art of telephony



MAP SHOWING VOICE VOYAGES MADE BY THE NATIONAL GEOGRAPHIC SOCIETY FROM WASHINGTON TO PITTSBURGH, CHICAGO, OMAHA, DENVER, SALT LAKE CITY, SAN FRANCISCO, PORTLAND, SEATTLE, EL PASO, OTTAWA, JACKSONVILLE, AND INTERMEDIATE POINTS

through the forty years that have passed since Alexander Graham Bell first solved the problem of sound transmission by electricity.

The telephone paid tribute to Dr. Bell, its father, by transmitting with equal fidelity the sound of music, the roar of breakers, and the intonations of the human voice. It paid its tribute to President Vail by proving that it indeed had grown to be a national institution in its geography, in its use, and in its possibilities. It paid its tribute to the great engineering staff, headed by John J. Carty, by demonstrating that it had, through them, ceased longer to be dependent on wires, but could now make the Hertzian waves its messengers—messengers which can travel eight times around the earth between the beats of the human heart.

The big banquet hall of the New Willard is nearly a city block long and perhaps sixty feet wide. Eight hundred people were seated around the tables of the huge gridiron, each with a telephone receiver at his elbow. At the one end of the great hall was a large map, with electric lights marking every junction station on the transcontinental voice highway, from Florida to Puget Sound and from Ottawa, Canada, to El Paso, Texas.

VOICE VOYAGES TO SEATTLE

After the courses had been served, the chief of the engineering staff of the American Telephone and Telegraph Company, Mr. John J. Carty, announced that the assembled guests would take a voice voyage to Seattle, Washington. Eight hundred receivers went to eight hundred wondering ears and the transcontinental roll-call began.

"Hello, Washington, D. C.," said Mr. Carty.

"Hello, Mr. Carty; this is Washington; Truesdale speaking," came the answer. And the bulb indicating the Nation's Capital on the electric map grew bright.



Photograph by Frederick Schutz

SOME OF THE GUESTS AT THE SPEAKERS' TABLE

Left to right: Mrs. Franklin K. Lane, Mr. Thomas A. Watson, Mr. Gilbert H. Grosvenor, Editor and Director National Geographic Society; Major General Hugh L. Scott, Chief of Staff and Acting Secretary of War; Mr. John J. Carty, Chief of the Engineering Staff of the American Telephone and Telegraph Company; Dr. Alexander Graham Bell; Mr. Theodore N. Vail; Secretary of the Interior Franklin K. Lane; Mr. O. H. Tittmann, President National Geographic Society; Secretary of the Navy Josephus Daniels; Mr. U. N. Bethell; Postmaster General Albert S. Burleson; Rear Admiral Colby M. Chester, U. S. Navy; Mr. N. C. Kingsbury; Mrs. Albert S. Burleson; and Senator Joseph E. Ransdell. The square, dark "box," with cord attached, in front of Mr. Carty, is an exact duplicate of the first Bell telephone. Through this instrument Dr. Bell talked from New York to San Francisco when the transcontinental line was opened January 25, 1915 (see pages 313 and 315).

"Hello, Pittsburgh," called Mr. Carty.

"Hello, Mr. Carty; this is Pittsburgh; Meighan talking," came the reply.

"What is the temperature there?" inquired Mr. Carty, "and the weather?"

SPANNING THE CONTINENT

One by one, without a moment's loss of time, they came in—Chicago, Omaha, Denver, Salt Lake City, Pocatello, Boise, Walla Walla, Portland, and finally Seattle—and in the time that it takes to tell it the guests had swept on an ear voyage to the Northwest Pacific region, and 11 twinkling lights aglow on the electric map showed in how many places the diners had been transported as hearers in those few minutes. In truth, the human voice was speeding from ocean to ocean, stirring the electric waves from one end of the country to the other, and greeting every ear that was on the line to hear.

GREETINGS FROM CANADA

After thus sweeping across the continent, the dinner party started upon an invasion of foreign soil. In less time than it takes to tell it, the voice dispatchers had perfected a through route from the capital of the greatest nation to the capital of her greatest neighbor. Washington was in whispering distance of Ottawa.

And from Ottawa came messages of international amity and good-will that were heartily reciprocated by all present. "The Postmaster General of Canada sends greetings," came the voice from Ottawa, "to the Postmaster General of the United States, and trusts that for the common good of the two neighboring peoples the cordial relations which have always existed between the two departments will endure for all time."

And then from the Rt. Hon. Sir Robert Borden, Prime Minister, came hearty greetings to the National Geographic Society, a tribute to its work, and a word of hope and forecast for its future.

"My greetings," read the message, "to the National Geographic Society and my congratulations on their achievements of another successful year. In speaking through word of mouth across so many miles, it is a pleasure to recall that the distinguished scientist and inventor who has made this wonderful feat possible and who has been one of the guiding spirits of your Society has also had ties of close association with Canada. One of the objects of the National Geographic Society is to increase our knowledge and comprehension of the various countries of the world. The value of such knowledge is inestimable, and I would bespeak for your efforts an even greater influence and appreciation in the future."

FROM THE MEXICAN BORDER

"There shall be no North and no South," declared a patriot years ago; and there was not at the Geographic dinner, for as soon as the voice-visit to Ottawa was over the party proceeded to the Rio Grande at El Paso. Flashing by Pittsburgh, Chicago, Omaha, Denver, Trinidad, and Albuquerque with a word of greeting to each, Washington was in a minute speaking into the ears of men hundreds of miles apart and hearing a chorus of voices from five different States.

"Is General Pershing there?" inquired Mr. Carty of El Paso.

"Yes, sir," answered Mr. Roach, several thousand miles away.

"Hello, General Pershing!"

"Hello, Mr. Carty!"

"How's everything on the border?"

"All's quiet on the border."

"Did you realize you are talking with 800 people?"

"No, I did not," answered General Pershing. "If I had known it, I might have thought of something worth while to say."

"Well, you know it now, so you can say it," advised Mr. Carty.

"My greetings to the National Geographic Society. I have attended some of its great dinners and know what impressive functions they are. I am a member of the Society and esteem it a rare privilege to help further its splendid work."

And there were cheers at the sentiment, just as though the words had come from the speakers' table instead of from El Paso.

"General Scott, Acting Secretary of War and Chief of Staff, is here, General Pershing," said Mr. Carty, "and he will talk with you."

But General Scott was too modest. He could fight Indians, put an army through its maneuvers, and march into the "inferno of a fight" without turning a hair, but he could not talk to one of his generals over a telephone on such an occasion as this.

After El Paso, Texas, came Jacksonville, Florida, and while a chilling March rain was falling in Washington it was a balmy summery night in Jacksonville, with the thermometer registering 70-odd.

And then the tide turned again. A switch in Washington moved and the voice-tide turned from the far Southeast to the extreme West. To Salt Lake City the route was the same as we had taken to Seattle, but there a switch was thrown and we were routed to San Francisco.

When we got there lights were shining on the electric map at 21 places in 17 States and one foreign country. We had visited them all on our dash around the country on the wings of the electric wave.

When we arrived in San Francisco, the toastmaster, Secretary of the Interior Franklin K. Lane, informed that city that the whole National Geographic Society envied those who lived there.

And then came Captain Gilmer, U. S. N., to the San Francisco telephone, and soon the head of the Navy at the Atlantic seaboard was conversing with one of his captains on the Pacific seaboard as though they were in adjoining offices instead of thousands of miles apart.

A VOICE FROM THE GOLDEN GATE

And then the voice of war yielded place to the voice of filial affection, and out of the Washington receivers floated a piping "Hello, mamma! How are you and daddy? I'm just fine." It was little Larry Harris, five years old, in San Francisco, calling to his mother, who, visiting in Washington, was one of the guests attending the Society's dinner.

Mrs. Lawrence W. Harris: "Where is King? Is King there?"

King: "I am, mamma."

Mrs. Harris: "Hello, King; how are you? King, we will see you in about two weeks. Your daddy wishes to speak to you."

Mr. Harris: "Hello, King; how are you, my boy? Who are you with?"

King: "I am with grandma."

Mr. Harris: "Well, you tell your grandma that this is no time for her to be out. Good-bye, boy."

Mr. Carty: "Mr. Harris didn't realize that it is now only half-past seven in San Francisco."

The voice of the little fellow and his brother King, age three, captivated 800 people and brought earnest applause as they at half-past seven in San Francisco said good-night to their parents at half-past ten in Washington.*

After the conversation was done, Washington began to say good-night to all of the stations with which it had talked, starting with San Francisco and coming east.

"Good-night, San Francisco," said Mr. Carty.

"Good-night, Mr. Carty," answered San Francisco, as her light on the electric map became dark. And so we said good-night to all of them.

TALKING WITHOUT WIRES

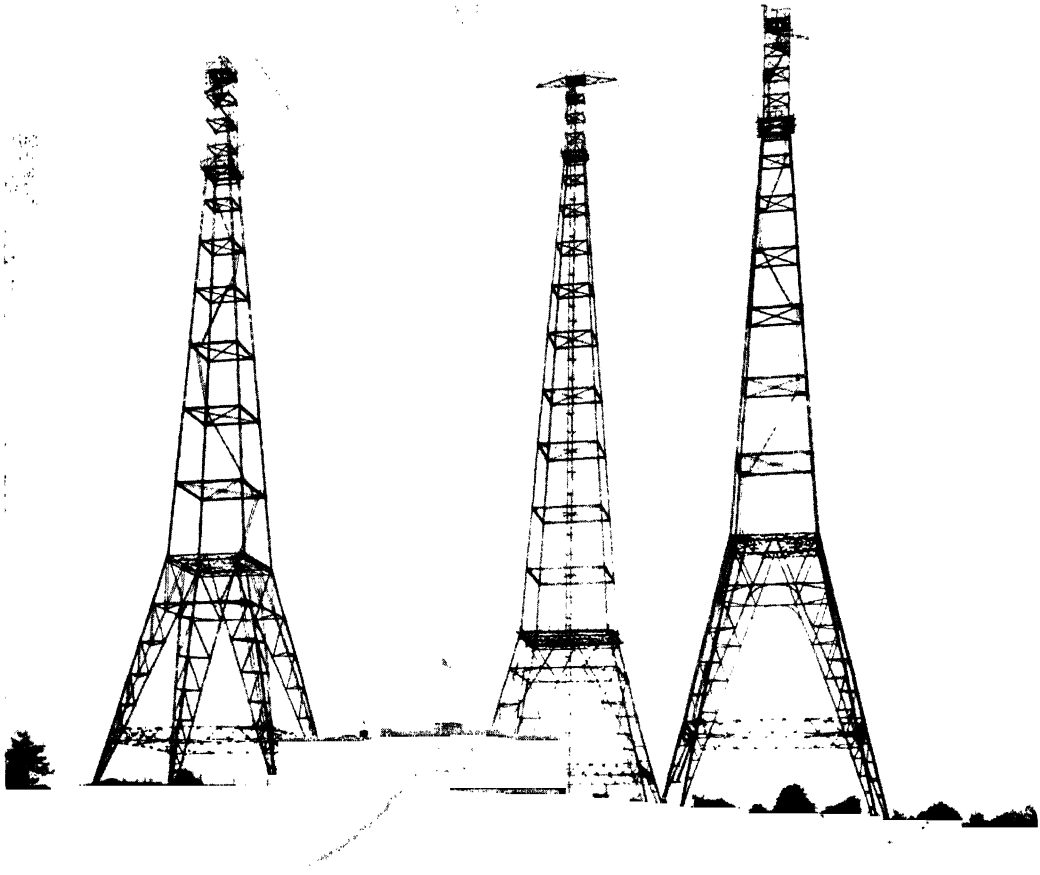
And then came a new series of demonstrations. Up to that time we were talking over wires. The messages were not free to move anywhere but along particular wires to particular places.

Now sounds were to be mounted on steeds of inconceivable fleetness and dispatched through the circumambient to everywhere in general and New York in particular.

* This was not the first time that a youngster had talked across the continent, however, for the very first child's voice flashed through the transcontinental wires was that of Melville Bell Grosvenor, grandson of Dr. Alexander Graham Bell, at the opening of the New York - San Francisco telephone, January 25, 1915.



Little King Harris, aged three, and his brother Lawrence, aged five, in San Francisco, are saying good-night to their father and mother, who, 3,000 miles away, are guests at the National Geographic Society banquet in Washington, D. C. (see page 300). It is 7.30 p. m. in San Francisco and 10.30 p. m. in Washington, D. C.



Photograph by Harris & Ewing

THE ARLINGTON WIRELESS STATION

It was from these towers that the human voice was heard nearly half way around the earth, when Mr. Espenschied, in Honolulu, overheard Arlington talking to Mr. Shreeve, in Paris (see pages 303 and 314).

When a wireless telephone turns loose a word into space, it does not travel through a lane to the point of destination; rather it spreads itself north, south, east, west, and literally fills the air with sound; so that we might, instead of "Those who have ears, let them hear," now say, "Those who have wireless telephones, let them hear." That is why Honolulu was able to eavesdrop on a conversation between Arlington and Paris. Dr. Bell has surely brought the eavesdroppers into their own when he has made it possible for them to hear in Honolulu what Washington says to Paris.

The first of these demonstrations was the talking over a circuit made up of two sections of wire and one of wireless. The banquet-room was connected by wire with Arlington wireless station. There the messages were transferred to the air. At New York they were picked up again by the wires and brought back to the banquet-hall.

And as people at the far ends of the hall held their receivers to one ear and listened to Mr. Carty and Secretary Lane talk into their telephones, the sound in the receiver seemed the voice, and the sound in the air the echo, so rapidly were the words conveyed on their 450-mile circuit.



THE TELEPHONE BUILDING AT EL PASO, TEXAS, FROM WHICH GENERAL PERSHING TALKED TO THE 800 MEMBERS AND GUESTS OF THE NATIONAL GEOGRAPHIC SOCIETY BANQUET AT WASHINGTON, D. C.

A NATION'S HEART BEAT

But this was not yet the supreme test—the test that brought the guests to their feet with hearts beating fast, souls aflame with patriotism, and minds staggered as wonder had followed wonder as minute followed minute.

Now a screen was stretched across the end of the banquet-hall, a moving-picture machine was wheeled into action, and the Star Spangled Banner flashed its thrilling beauty upon the screen.

Over at Arlington wireless station a phonograph began to play. Out of its vibrant throat leaped a nation's patriotism expressed in song. A wireless transmitter gathered the notes and gave them to the Hertzian waves. The sounds that the phonograph itself released into the air were soon lost. They were as much slower than the wireless impulses they started as a snail is slower than the fastest big-gun projectile.

For nature made sound travel 360 yards a second, while the wireless telephone has given it a speed of 186,000 miles a second. Thus a wireless message envelops the whole earth in the time that a sound in its native element spreads over a circle 144 feet in diameter. Dr. Bell has made the human voice able to travel nearly a million times as fast as it could before he invented the telephone.

It was less than the proverbial twinkling of an eye between the utterance of the sound by the phonograph at Arlington and its receipt in the 800 receivers in the banquet-hall; and as it floated in gently and softly, yet clearly and impressively, its stirring appeal moved every



BUILDING TRANSCONTINENTAL TELEPHONE LINES UNDER DIFFICULTIES

In hauling the heavy redwood poles over the western desert the construction gangs have to build their own roads

soul to song, and the hundreds present joined in our national air:

"And the Star Spangled Banner in triumph shall wave
O'er the land of the free and the home of the brave."

It was an inspiring moment, quickening the pulse, electrifying the mind, and causing waves of enthusiasm to sweep over the banquet-hall as billows over the sea.

It was then that Dr. Bell exclaimed: "We have just been hearing 'The Star Spangled Banner' by wireless and the audience has joined in singing it. It occurs to me that by means of the telephone the millions of people of the United States may soon sing 'The Star Spangled Banner' all at the same time."

And then came the speech-making; but it was a subdued, an overwhelmed, a reverent audience that the speakers addressed. The spirit of mirth and levity had no place among people who had witnessed such marvelous exhibitions.

ADDRESS OF THE TOASTMASTER, HON. FRANKLIN K. LANE, SECRETARY OF THE INTERIOR

I do not know how you feel after the exhibition that has just been given to us, but for myself I can say that I feel humbled and meek and overwhelmed, for no man can say, after the things we have seen, after the things that we have heard, that anything is longer impossible.

They tell me that this is a cynical age—an age that is materialistic and without faith—but, standing in the presence of these miracles, these wonders, I say to you that it is, above all ages, the age of faith.

No man can say that it will not be possible at some future time to talk, as I threatened to talk tonight, to the planet Mars. There is probably not one man or woman here who, forty-five years ago, would have said that it would ever be possible to talk across this continent by wire, much less to talk to New York and back again to this hotel by wireless. This age is not cynical, is not without faith. The motto of this age might very well be the words from Peter Pan. We do believe in fairies. The only difference is that we have changed the kind of fairies that we believe in, and instead of believing in Hop-o'-my-Thumb and Jack of the Beanstalk, we believe in fairies like Marconi and Pasteur and Carty and Graham Bell.

We live in a city that is studded about with statues of men who have made large sacrifices and done great service for our country, statues of our generals, crowned by that wonderful monument that pierces the sky, to the man that led us in our fight for independence; and soon we will add to that the great Greek temple that is to be forever a monument to the man who kept this Union for us.

But where are the statues to the men who have made America? Where are the statues to the men who are the inventors and the engineers and the discoverers of this continent? Out of my office every day go 250 patents. Our people have the greatest resources of any people in the world, not in their soil—although that is without equal; not in their minerals—though no other nations can rival us as to minerals—but in the inventive genius of the American mind, which we honor tonight.

Other countries do honor to men of this class. They may command a knighthood or a baronetcy. We cannot indulge in such luxury, but the National Geographic Society can hold a banquet in honor of such men and crown them with the laurels of our affection and admiration.

THE INGENUITY OF MAN

The men who make this world and the men who serve this world are preëminently the men who work in laboratories and in workshops. The boys across the water may believe that theirs is the real conquest of the world; but it is not so. The world is being conquered by the mind and the ingenuity of man.

In Paris there are two monuments that have always attracted my attention—the Tomb of Napoleon, which every one sees; but behind the dome of the tomb there is a modest statue to Pasteur, a man whose name will be remembered when the names of generals and monarchs and emperors are forgotten, and on the front of that monument there is a picture of a girl, the statue in relief of a girl just rising from her bed, leaning against her

mother, and the mother is looking up in gratitude in Pasteur's face above, while in front of her the figure of Death slinks around the corner of the statue. To such men should our monuments be given, because they are those who conquer this world.

BATTALIONS OF COMMERCE

But it is not for me to talk to you tonight, but to give you an opportunity to see those who have done things. This is a city of almost perennial talk, and it is proper that such an exhibition of the telephone should be given here. But it is not often that we have an opportunity to see those men who have throughout half a century given their genius to our country and made it distinct on the face of the earth. One of the rarest qualities in man is the genius for organization, and I want to present to you a man who has under his direction tonight 250,000 men and women—the man who came from a department of this government forty years ago, and who has organized the greatest telephone system in all the world—Mr. Theodore N. Vail.

ADDRESS OF MR. THEODORE N. VAIL, PRESIDENT OF THE AMERICAN TELEPHONE AND TELEGRAPH COMPANY

This splendid compliment to "telephony" and to those identified with it, coming as it does on the official birthday of the telephone, is most highly appreciated by us all, and recalls to me many points of mutuality.

The home of the Society is in the beautiful "Hubbard Memorial." Mr. Gardiner G. Hubbard, the father of the telephone business, was the sponsor and father-in-law of Dr. Bell, inventor of the telephone, was one of the godfathers of this great Society, and grandfather-in-law of Gilbert H. Grosvenor, the man who has done so great a work in the development of the Society and of its Magazine, devoted to the spreading of geographical information. The part taken by Mr. Hubbard in laying the foundation of the existing telephone business, in opening up the vista through which we could all see its future, and the contributions made by him to the general business policy which has had so essential a part in the greatness of the business can never be overstated.

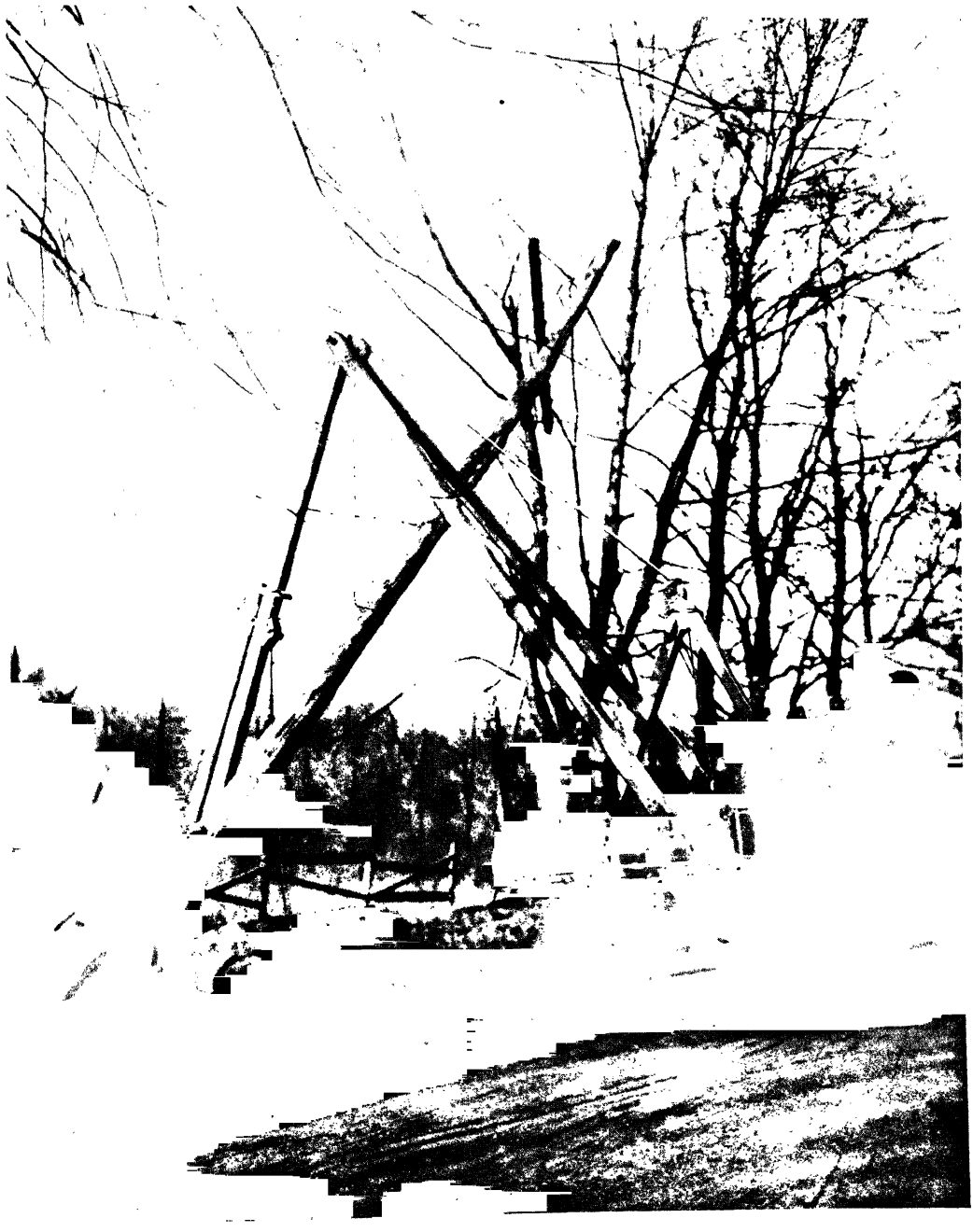
As general superintendent of the railway mail service, I was brought into intimate personal contact with Mr. Hubbard, who was the chairman of a commission created by Congress to investigate and report upon the then aspects of the always-with-us controversies over the compensation of the railroads for transporting the mails. Congress had recently made a horizontal reduction. On the trips of the commission over the country Mr. Hubbard carried with him a few telephones, and without neglecting the work of the commission, he at every opportunity exhibited and explained this marvelous invention. We discussed the business, its possibilities and potentialities, and the policies which should underlie its development, so that my connection with the telephone may be said to date from its inception.

THE GLORIOUS CAREER OF AN UGLY DUCKLING

The apparatus was extremely crude and very unsatisfactory. A child never was born with less apparent promise of the destiny it has attained. Yet there never has been a discovery or an invention that in the short life of forty years has so revolutionized that with which it has had to do (see page 310).

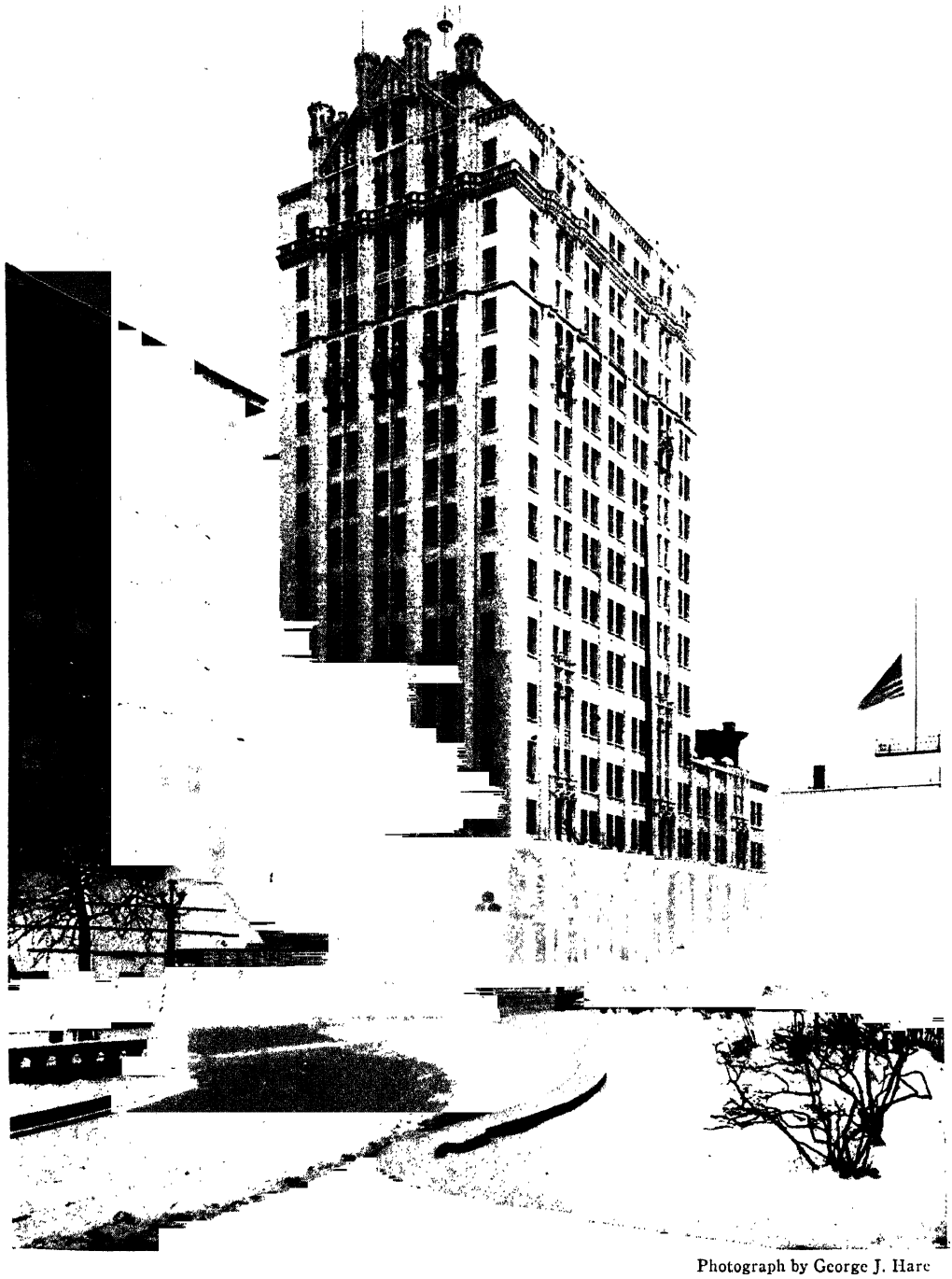
The four associates—Bell, Hubbard, Sanders, and Watson—who were behind the telephone, under the leadership of Mr. Hubbard, started the business in 1877. The first corporations which brought capital and organization to practically and systematically exploit the business were formed in 1878.

To look back on those days, it seems as if they had covered ages; yet it was but three years, from 1876, the natal year of the telephone, to 1879, the year in which the settlement with the Western Union was made, and the first big hill in the life journey of the telephone was crossed. At least two of these three years were employed in teaching the telephone itself how to talk intelligently and satisfactorily; for not until 1878



THE NEW WAY IN TELEPHONE LINE CONSTRUCTION

Motor trucks are used to haul a derrick from hole to hole, and four men can do the work that formerly required a dozen. The Bell Telephone System has spent twice as much money in the same length of time (1906-1914) for the extension of the telephone service of the United States as the United States government has spent for the construction of the Panama Canal (see page 322).



Photograph by George J. Hare

A TELEPHONE BUILDING IN BUFFALO, NEW YORK

It is in such modern structures as this that the great "union stations" of the telephone world are found, Trains of electric impulses are dispatched to all parts of the continent from them. "New York City alone, exclusive of its suburbs, has twice as many telephones as the whole of France, nearly one-half as many as the German Empire, and quite as many as the whole of Spain, Portugal, Switzerland, Italy, Greece, the Balkan States, Turkey, and Russia combined" (see page 321).

was a practical, commercial, dependable, usable instrument developed.

From the settlement with the Western Union the history of the business is well known; its progress is familiar to you all, and this evening you have had a demonstration of what can now be done and indications of future possibilities.

THE BATTLE OF DAVID AND GOLIATH

The most important single event in the history of the telephone business may be of interest.

The telephone patents had been offered to the Western Union, but the offer was declined. Through the Gold and Stock Telegraph Company, the Western Union was doing a profitable local private-line business, using printing telegraph instruments. The first development of the telephone was for use on private lines, replacing the printing instruments. When the Western Union realized this, to protect its business, it entered the telephone business in competition with the Bell, operating under various patents which it claimed were independent of the Bell patents.

The Bell interests were devoting their energies to developing telephone-exchange business. The Western Union, through its prestige and power, had for a little while a seeming advantage. The fight was a David and Goliath affair. The Western Union was the largest and most powerful corporation of the time—relatively greater than anything that exists today.

Eventually a compromise was proposed. The Western Union believed the great future of the telephone to be in private-line use; the Bell believed it to be in the exchange service, which is in fact a system of private lines from the central office to each subscriber. By means of switchboard and trunk lines any subscriber's private line can be connected with any other subscriber's private line, constituting a private line from subscriber to subscriber.

The negotiations hung on the condition denying to the Bell interests the right to connect their exchanges by means of toll lines. Few had faith in the future of the toll lines or their value as compared with the private lines, but if long-distance conversation should be developed the Western Union feared it might be a menace to the telegraph business. Time has demonstrated that the telephone can never be substituted for the telegraph instrument; that the long-distance telephone is not competitive with telegraphy, but has a distinct field of its own; that the telephone system is supplementary to, not competitive with, the telegraph system.

The prospects for the future of toll lines or distant speaking—the idea of carrying the voice any great distance—met with little serious consideration, and the idea of speaking across continents met with ridicule. Our engineers, at a considerably later period, thought it might be possible to talk to Chicago, if we had a big enough wire; but the bigness was prohibitive.

The conferees of the Bell were divided about the toll business; some of them tired of the contest, preferred half a loaf in peace and comfort, rather than a struggle for a whole loaf; if yielding would bring about a settlement, some were willing to yield. To me the idea of yielding the toll-line use meant the curtailment of our future, the absolute interdiction of anything like a "system."

At the end of a nearly all-night session on one of the Sound boats en route for New York, we had a unanimous committee, who determined the Bell should retain the exclusive and unlimited right to telephones for exchange service with a 15-mile radius, and for conversational purposes, any distance, but willing to yield to the Western Union the exclusive right to the telegraph business and to private lines. On this the Bell stood, except that the private-line right was made non-exclusive, and the settlement made on these lines determined the basis for the telephone development.

THE REWARD OF RESEARCH

The present development of the telephone is not due to disunited effort, although many and valuable suggestions and inventions have been either concurrently or independently developed outside the Bell system. It is due to the centralized, coöperative coördinated work of the

departments of operation with the departments of engineering, experiment, research, and development—of the whole Bell system. Research, investigation, experiment, comprehensive and thorough, are now necessary to hold any position in any industrial or utility enterprise, and those on a large, comprehensive scale are enormously expensive.

This centralization has produced a high and most completely developed system; beyond every point that has been reached there have always been possibilities of something greater, and these possibilities have been the goal of every one connected with the business.

It is a unique coincidence that the two epoch-making inventions which created the art of electrical transmission of intelligence were made by men absolutely outside the field of electricity. Professor Morse was an artist. From his reading of Professor Henry's discovery of the magnet and the possibility of controlling its action from a distance, he conceived the idea of transmitting combinations of signals, to be interpreted into figures, letters, words, sentences. He had no scientific or mechanical education or training and little money. He found in Alfred Vail an assistant, one who had a scientific education, mechanical training, skill, and ingenuity, who had a father with common-sense enough to believe in the idea, money and courage enough to finance it.

ONLY ONE MAN ON THE RIGHT TRACK

There were many working on the multiple telegraph, but from different standpoints and for different purposes—among them Professor Bell. He had in Watson a trained mechanic, and in Hubbard and Sanders believers and capitalists. Bell was not an electrician, but was trained in articulation and the science of speech. His powers of observation, and particularly of perception and deduction, were great. In his telegraph studies and experiments he observed some phenomena from which he evolved the idea of the telephone, and when he recognized in the vibrations of the reed the peculiar timber of vocal speech he knew he had the solution.

There was no one working on the speaking telephone, except Professor Bell, who could have invented it. They were approaching the subject from the standpoint of electricity without the knowledge of acoustics or the requirements of speech production, or the character of vocal vibrations, of which Bell was the master. This knowledge was the key to the invention.

It was so simple that all wondered at it, and so seemingly impossible that all ridiculed it; but so soon as it became of utility many claimed, copied, and pirated it.

There was not and never has there been any telephone made which is not based on Bell's patent, and, with the exception of what Berliner contributed, his invention contained all that is essential in the instrument in use today; and yet the only time when Bell was the undisputed inventor of the telephone and the Bell Company without opposition was during the year 1876, before its commercial value was recognized, although every one acknowledged its scientific importance.

GEOGRAPHY AND THE HUMAN VOICE

The Geographic Society has a symbolic picture with the inscription, "The Geographic brings all the world to you." It might be said that the telegraph brings all the world into immediate communication, and the telephone fetches your voice and conversation to the world.

Geography establishes position and determines distances; discovers the potentialities of the world and reveals the paths of intercommunication.

Geography may be termed the anatomy, transportation the veinous or arterial system, and telephony and telegraphy the nervous system of the world and its economic and social structure.

Intercommunication, of which the telephone is the latest exponent, binds this world together, draws its interests closer, and will in time create a condition wherein all interests will be common to all people.

Common interests, patriotism — the bases of all communities, commonwealths, or nations—can only permanently exist where there is common language. Natural and permanent boundaries of nations are so established.



Photograph by M. Rosenfeld

MANHOLE WITH CABLES READY FOR SPLICING

These huge cables are each made up of thousands of insulated wires sheathed in lead and carried into the telephone exchanges. The largest cables used contain 2,400 individual wires.

Geographic science is fast revealing the world and its possibilities and potentialities; intercommunication is fast utilizing these discoveries and making necessary to all people common language or common understanding of languages, and when that common understanding comes, which is bound to come with free exchange of thought and ideas, then will come a common brotherhood.

GEOGRAPHY DISSIPATES SUPERSTITION

It will take time to overcome the force of inertia which binds the man to the inherent, inherited, inbred ideas, traditions, prejudices, habits, conventionalities, which endure through generations and are overcome only by new experiences, new knowledge. Some term this conservatism, but it is nothing but the inertia that comes from lack of a new knowledge vivified by new experiences.

Geography reveals the world and makes it real; it dissipates the haze and fog of superstition and tradition, attracts and encourages the travel which brings expansion. In this vast field there is abundant room for practical, constructive imagination to work. The immediate future is only dimly outlined by the light of past experience and present knowledge; the distant future is still in the shadowy haze of uncertainty, speculation and doubt; but, though it may be too optimistic and too hopeful, there seems to me no doubt but that progress in the future will be as marked as in the past.

There can be but few great developments in the future of which the beginnings have not been made or have not been foreshadowed. Each age has believed it had reached the acme of evolution in economical, commercial, and artistic lines, and that but little more was possible. In "transportation" the newly introduced stagecoach of the eighteenth century gave way to the steam railroad expresses of the nineteenth century; and electrical and aërial transportation are dawning in the twentieth. In "intercommunication" the signal lights of the Middle Ages gave way to the semaphore of the eighteenth century—the electric telegraph of the early, supplemented by the telephone in the late, nineteenth century. And in the twentieth comes the dawn of transcontinental, transoceanic, and circum-mundane electrical intercommunication and conversation!

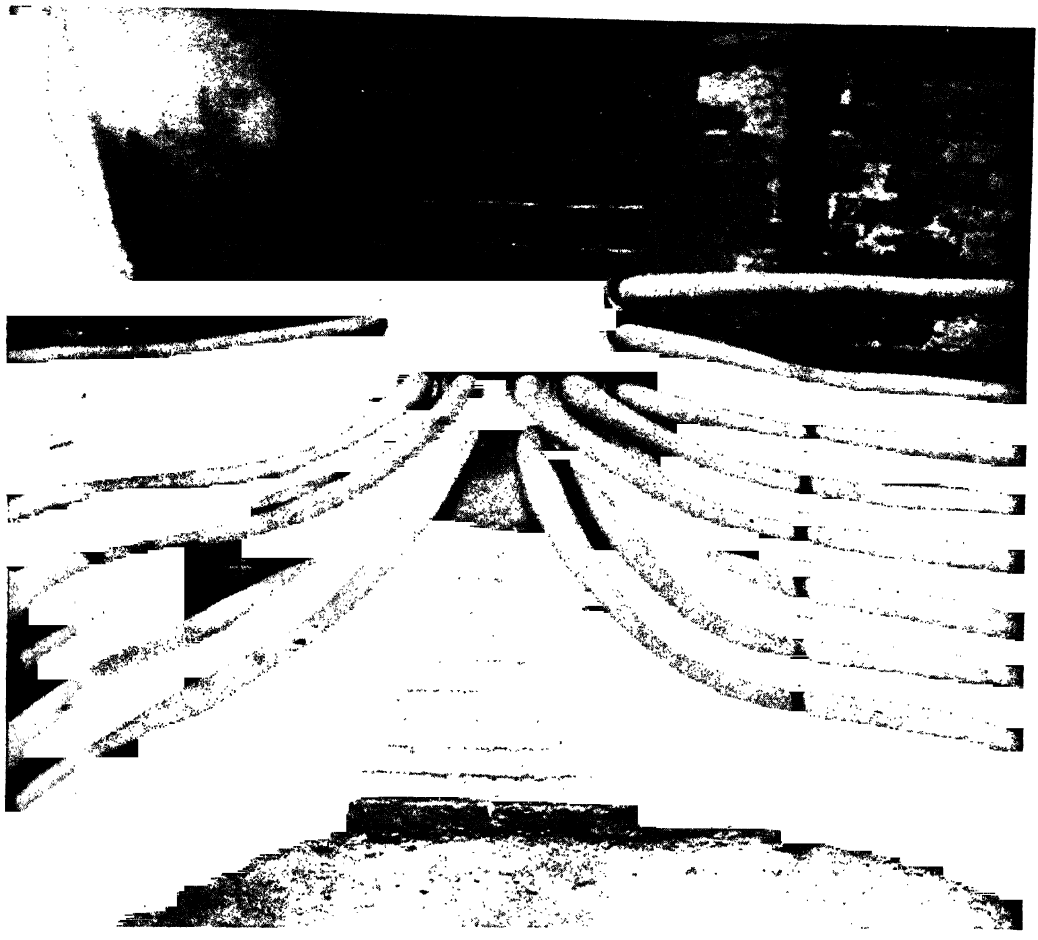
When Mr. Bell and Mr. Watson first talked in public over the telephone, or Mr. Hubbard first tried to interest constructive interests in the new "Yankee toy," if either had prophesied as possible what actually exists today, he would have been laughed at. Those who laid the foundation of the business could well define the structure, but its magnitude has far surpassed expectation. When my connection with the telephone was announced, one who was then a Representative and afterward a Senator and a Cabinet Minister, whose name always commands respect, said to me: "Vail, that isn't a big enough business for you." Consider that in the light of today!

SOME DAY WE WILL BE ABLE TO TELEPHONE TO EVERY PART OF THE WORLD

Is it too much to think that in time it will be possible for any one, at any place, to immediately communicate with any one at any other place in the world by reasonably available methods; that distance will be annihilated and the whole world will be united in common interests, common thought, common traditions, and prejudices? Then and only then can there be a common people.

The wonderful work that geographical research did in opening up the unknown world in the late seventeenth, eighteenth, and early nineteenth centuries presented a new field to the people of initiative and enterprise, of an Old World already bursting its confines by its overdevelopment.

This world development, for which geographic research is largely responsible, is in turn responsible for the magnitude of present operations, economic and social. This immensity is constructive, not destructive; is something to be welcomed and encouraged rather than persecuted and destroyed. It is something



THE MAIN LINES OF THE VOICE RAILWAY WORLD (SEE ALSO PAGE 311)

which is uplifting all men, raising them up to higher levels and possibilities, and is neither oppressing nor taking away from man any possibility of greater enjoyment or of better things. It is bringing to him and within his power of acquisition those things which were formerly for the few. It is making possible all things that can bring the extremes of mankind nearer together.

A WORLD-WIDE BENEFIT

This economic industrial development of the world is caused by that coöperation, that coördination of effort which assigns to individuals the tasks and duties for which each is best fitted, and in this way gets the most out of the efforts of all. It will not, nor can anything ever make any one independent of individual effort or raise any one above his inherent possibilities.

This development is so infinitely greater than that of the past, and has come so much faster than the minds of men could possibly become adjusted to it, that there has been no standard familiar to man's mind by which to measure it. The abuses which always accompany any movement, great or small, are looked upon as integral elements of them, not merely incidental. These misunderstandings, the inclination to introduce repressive and corrective measures, where only directive measures are wanted, are caused by the *vis inertia* of men's minds and the im-



Photograph by M. Rosenfeld

CHELSEA TELEPHONE EXCHANGE: NEW YORK CITY

A hundred dispatchers here handle the thousands of trains of talk that hourly pass through the big terminal. "Is it too much to think that in time it will be possible for any one, at any place, to immediately communicate with any one at any other place in the world by reasonably available methods; that distance will be annihilated and the whole world will be united in common interests, common thought, common traditions, and prejudices? Then and only then can there be a common people" (see page 312).

possibility of adjustment to the rapidity and immensity of the development.

When the true understanding comes, all will unite in directing and guiding and protecting; then and only then shall we reap the full benefits of man's developing powers and understanding and of man's initiative and enterprise.

ADDRESS OF DR. ALEXANDER GRAHAM BELL

I am really overwhelmed by the realization of the greatness of the demonstration that has been given us tonight. Wonderful! Wonderful! It brings back to mind the significance of the first message ever sent by the Morse telegraph, "What hath God wrought!"

I am overwhelmed in more ways than one. I do not see what I have had to do with this thing. Many, many minds have contributed to the development of the telephone of today, an army of workers organized under Mr. Vail and Mr. Carty, and the researches of the telephone and telegraph company have been required in order to bring these marvelous results.

When I try to find out what I have done and look back to the long vista of years, I see only this (*holding aloft the first telephone instrument which demonstrated the possibilities of transmitting the voice by electricity*), the original Bell telephone, Mr. Watson and myself working hard at it to make it speak. It was a most disappointing introduction to this wonderful art. Mr. Watson could always hear a great deal better than I could. He could hear phone speech sounds and occasional words, and I tell you it was a great day, on the 10th day of March, 1876, when at last there was no doubt about it; complete words and sentences were understood both by Mr. Watson and myself. I can remember very well talking into the instrument, which was connected with the next room, and said: "Mr. Watson, come here, I want to see you." And he instantly came into the room, and I was delighted to know that he had understood.

It was only a short time ago that I was talking from New York to San Francisco—Mr. Watson in San Francisco and I in New York—and I was asked to repeat the same sentence which was the first to be transmitted over and through this instrument itself, and I put my mouth to this old telephone in New York and called out to Watson in San Francisco: "Mr. Watson, come here, I want you." He replied: "It would take me a week to get there now" (see page 298).

Now I cannot claim very much credit for all this wonderful development. I can see this whole telephone away in the distance and extending from it an army of workers laying wires and extending the influence of the telephone, headed at first by the first President of the National Geographic Society, Mr. Gardiner Greene Hubbard. Then, as this army of workers extended to this great general, Mr. Vail, who has brought the telephone system in America to completion.

DREAMS THAT CAME TRUE

Away back in the old days I dreamed of wires extending all over the country and of people in one part of America talking to people in another part of America. It was the dream of a dreamer, but Mr. Vail has made it come true, and today we have been witnesses of the fact that there is no part of this continent that is inaccessible to the human voice. Mr. Vail has brought this instrument into every home. What would business be without it? It has even gone into warfare and into the trenches in Europe; in fact, Mr. Vail is evidently trying to make the telephone "First in war, first in peace, and first in the hearts of his countrymen." He has covered this continent with a network of wires, millions of miles in extent: he has accomplished the dream of my youth of the wires that should cover this land.

But our good guest of the evening, Mr. Carty, is going further than this and he is getting out all the wires. It was only a few weeks ago that Mr. Carty and his associates demonstrated the possibility of wireless telephony by talking from Arlington here to the Eiffel Tower in France, and a man in Honolulu overheard the conversation.

Where are wonders going to cease? Why, that is a distance equal to one-third of the circumference of the globe. Is there any part of the globe that Mr. Carty

may not reach by telephone and without wires at all?

I am struck to the heart to meet my old friend, Mr. Vail, for we nave not met since we were young men, and we are not so very old now. Yet we look forward to see what Mr. Carty and his brilliant associates of the American Telephone and Telegraph Company will bring forth in the future.

ADDRESS OF MR. JOHN J. CARTY, CHIEF ENGINEER AMERICAN TELEPHONE AND TELEGRAPH COMPANY

There are many who are yet to speak to us, and as I have already spoken so many times this evening and to so many places, I must be brief in what I have to say now.

These demonstrations in which you have all taken part tonight are not the result of the work of any one man; they are made possible by a long line of investigators, beginning with Dr. Bell himself. For my own part, I am fortunate in being the chief of the large staff of engineers and scientists which has put into practical form and placed at the service of the public these marvelous developments which have been exhibited before us tonight.

Some of these men, I am glad to say, are present with us. There is Mr. Shreeve, who, at the Eiffel Tower, heard the first words spoken across the Atlantic. Mr. Espenschied, who was stationed at Honolulu and heard Arlington talking to Mr. Shreeve at Paris, is on duty tonight at the Arlington Tower, where you all heard his voice speaking to me. Then there are Mr. Gherardi, Mr. Jewett, Mr. Mills, Mr. Drake, Mr. Thompson, Mr. Blackwell, Mr. Robinson, Mr. Arnold, Mr. Colpitts, Mr. Campbell, Mr. Heising, and Mr. England.

TELEPHONY IS AN AMERICAN ART

These young men all illustrate very well the character and make-up of the staff. They are all from American colleges and universities; some of them trained under Dr. Pupin, whose classic invention, the loading coil, is employed in the San Francisco line. One of these young men is a graduate of the University of North Dakota and another is a graduate of the University of South Dakota, and each has taken his postgraduate studies in another university. Instead of going to Germany, France, or England, which was formerly necessary for such advanced work, they did not have to go any farther east from the Dakotas than to the University of Michigan and the University of Chicago, where they received postgraduate scientific training equal to what they could get in the best European universities.

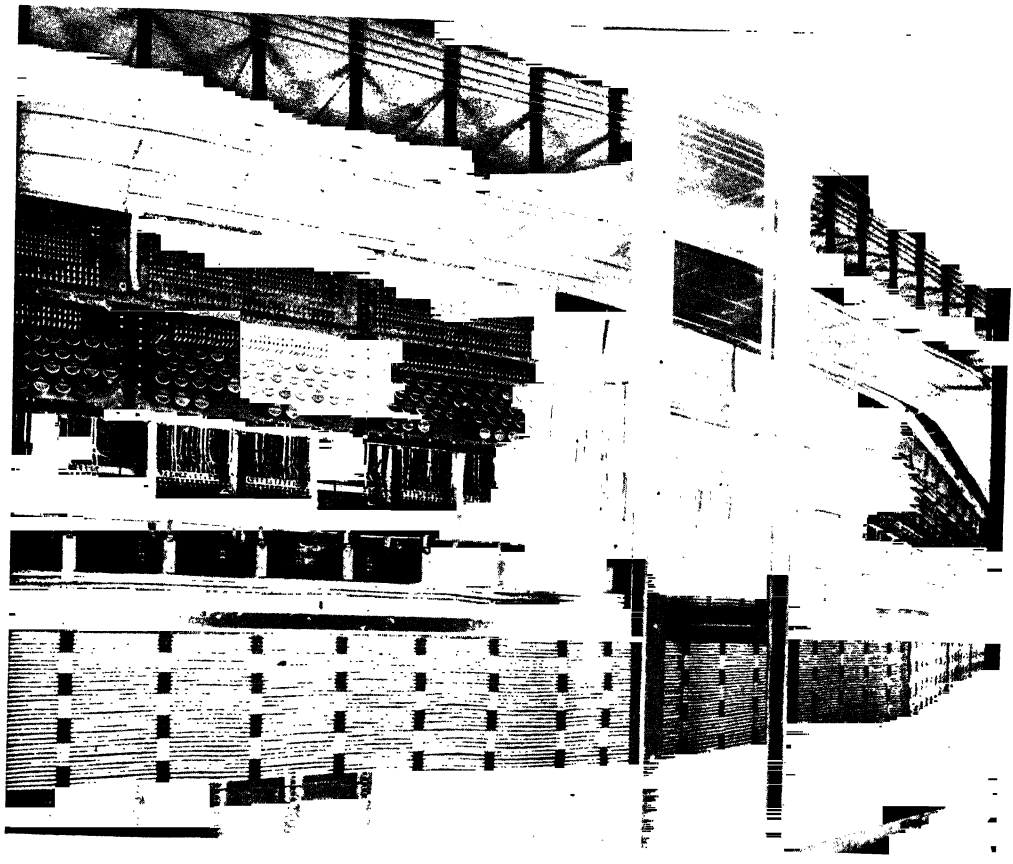
It is a most interesting and encouraging sign of American scientific development that two of these young men are from universities in North and South Dakota, States which were inhabited largely by savages at the time when General Scott was on the frontier conducting Indian warfare. There was a time when it was necessary for us to go abroad to study the arts, but in respect to one art at least the tide has turned, for in order to study the art of telephony it has long been recognized by the nations abroad that their engineers must go to America, the home of the telephone.

This splendid recognition which the National Geographic Society has accorded to American telephone achievement will be received with feelings of deep appreciation by American telephone engineers; and, speaking on their behalf, I can assure you that in the future, as we have always done in the past, we will in all things pertaining to the art of telephony keep secure for our country the foremost place in the world.

ADDRESS OF HON. THOMAS WATSON, OF BOSTON

I am very proud and glad that I was chosen by the fates to be the associate of Alexander Graham Bell in all the experiments by which the telephone was perfected.

To tell you one-half of what Dr. Bell did during the three years I was associated with him would take me the rest of the night, so I cannot do it. However, I want to describe the one incident which was very important in the history of the telephone, the night when Dr. Bell and I talked over a real outdoor telephone wire



THE REAR VIEW OF PART OF THE SWITCHBOARD SHOWN ON PAGE 314

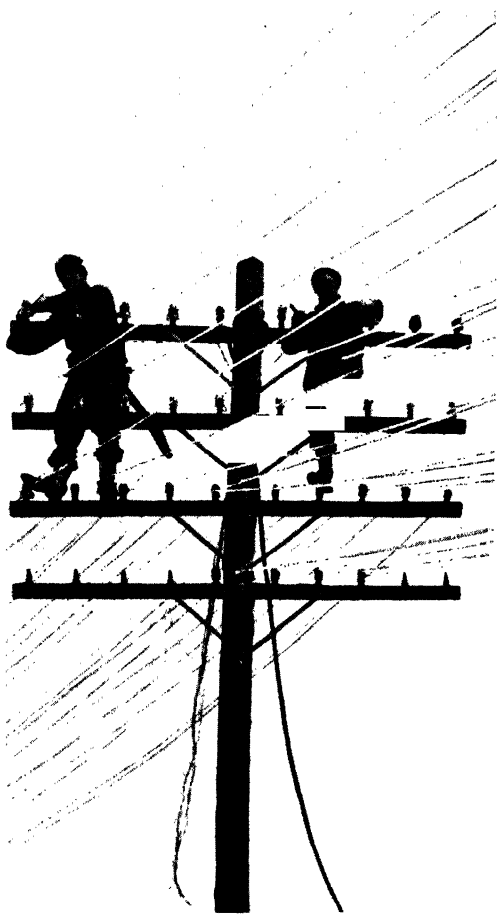
"The two States of New York and Pennsylvania have as many telephones as the whole of Great Britain, France, Belgium, Italy, Serbia, and Russia combined, while Ohio and Illinois have as many as Germany, Austria-Hungary, Bulgaria, and Turkey combined" (see page 321).

for the first time. I made with my own hands for Dr. Bell, under his direction, the first speaking telephone the world has ever seen, but there were 16 months' hard work after that before Dr. Bell thought his baby was big enough and strong enough to talk outdoors.

On the 9th day of October, 1876, a very important day in the history of the telephone, Dr. Bell had obtained permission to use a wire running from Boston to Cambridge, about 3 miles long, and on that evening I went out with one of the best telephones that had been devised up to that date, and Dr. Bell proceeded to Boston with its duplicate. I waited out at the Cambridge factory until Dr. Bell signaled on the telegraph instrument that he was ready. I think I was then more excited than I ever was before in my life, or ever have been since, and I connected up the telephone to listen to what Dr. Bell would say, and I could not hear the faintest sound.

I shouted back in the telephone and listened again, and there was nothing but the blackest, dreadful silence. I knew that we were working against the most delicate electrical current that had ever been used for any practical purpose, and as I could not hear his voice I thought that the delicate current must have leaked off of every insulator so that none of it got across the Charles River to where I was.

I had almost made up my mind to disconnect the telephone and telegraph back to Dr. Bell that while his telephone might do very well for speaking tubes, it never would compete with the telegraph. Then



REPAIRING THE DAMAGE DONE BY SNOW AND SLEET

I happened to think that there might be another telegraph instrument connected in the circuit in some other part of the factory that I was in.

The janitor had been standing there looking at me as if he thought I was crazy, shouting into the end of the wire and expecting somebody in Boston to hear me. I asked him to show me where the wire entered the building and he did so. I traced it through the building and found another telegraph relay in the same circuit. My heart gave another jump, for I realized that there was another chance. I got it out, rushed back to the telephone, and listened.

That was the sole cause of the trouble; far louder and more distinct than I ever heard it before, Dr. Bell's voice was coming out of that instrument, and he was saying: "Watson, are you there? Are you listening? What is the matter?" I shouted back, and then ensued the first conversation that ever has been held over a real telegraph wire.

Some of Dr. Bell's pessimistic friends had been objecting and saying that the telephone would never compete with the telegraph business even if he did get it to talk over an outdoor wire; so he made an arrangement with me and I went to Cambridge, and everything I heard him say through the telephone I wrote down, and what I said to him he would write down at his end of the wire, so that the record could be put side by side to prove to the croakers that the telephone could really transmit intelligence accurately. That was done; so that first conversation was preserved, word for word.

After he finished making the record, which perhaps took a couple of hours, we were so fascinated with the joy of talking over a real telegraph line that we kept up our conversation, without recording it, until the small hours of the morning, and I can assure you, ladies and gentlemen, it was a very happy boy who wended his way back to Boston early the next morning with a telephone under his arm, wrapped up in a newspaper.

A LANDLADY WHO COULD NOT APPRECIATE SCIENCE

Dr. Bell was not at the laboratory when I got there, for he had gone to the newspaper office to tell them about the wonderful occurrence of the evening; but when he came in, so enthused and jubilant, we really danced a war-dance. When Dr. Bell used to celebrate he would do so with a war-dance, and I really got so that I could war-dance nearly as well as he. That night we had a jubilee and a war-dance that lasted for some time, and when our landlady met me the next morning on the stairs she made the remark that if we did not stop making so much noise in the rooms of nights we would have to vacate. Our landlady was not at all scientific in her tastes, and I think I remember we were a little behind in our rent.

That was the beginning of this stupendous thing we call the Bell system today, and it almost takes my breath away

to see what it has passed through. I have been out of the telephone service for 30 years, but I say it almost takes my breath to see what has been done in the years that I have been away from it; and when I think of the men in charge of this—Mr. Vail in charge of the business organization and Mr. Carty and his associates following up the technical scientific part of it—I must say that I have found boundless hopes for the future, and I can only ask in amazement what they will next do. I thank you.

ADDRESS OF UNION NOBLE BETHELL, SENIOR VICE-PRESIDENT OF THE AMERICAN TELEPHONE AND TELEGRAPH COMPANY

While I am in entire accord with Mr. Carty in his characterization of the telephone art as an American art, when he was talking I could not but think of something which is said to have happened recently in the capital city of Pennsylvania. A number of citizens of that great Commonwealth were gathered together, and were congratulating themselves upon the greatness of their State and the number of its sons who had attained prominence throughout the nation and throughout the world. At length one of the number said to his brethren: "Gentlemen, I desire to propose a toast to that greatest of Pennsylvanians, Benjamin Franklin, of Massachusetts."

A FITTING TOAST

So I think it entirely proper and fitting for us on this occasion to extend our congratulations and felicitations to the foremost figure in the creation of this American art, that distinguished American, Dr. Graham Bell, of Scotland.

We all know, though, that Dr. Bell is an American as much as any Pilgrim Father ever was. Americans of his type, who could not control the accident of birth, have helped to transform a wilderness into sovereign States, and to create great industries, important cities, vast empires, and all that sort of thing. They are proud of America and America is proud of them.

In this age of achievement and efficiency it is very difficult for us to realize the significance of what we have seen and heard tonight. We are so apt to take things as a matter of course. It is only by contrast that we can get a right perspective and form true conceptions.

WHERE TELEPHONES WOULD HAVE AVERTED A GREAT BATTLE

When Cornwallis surrendered his sword to Washington, a swift ship—mark you, a *swift* ship—was dispatched to England to carry the news. It was bad news, and we all know that bad news travels fast. Yet 37 days elapsed before George III knew that he had lost some colonies and gained some cousins.

At the close of the succeeding war, that of 1812, the transportation of news was still so slow that the battle of New Orleans, the bloodiest battle of that war or the preceding war, was fought fully two weeks after the treaty of peace was signed at Ghent, and some time later the news of the conclusion of peace and of Jackson's victory reached the city of Washington about the same time.

In 1843, when the Oregon bill was under discussion in the United States Senate, leading Senators declared that we could never have any interest in a country so remote as that with which we have been conversing so easily and familiarly this evening. "Why," declared one Senator, "it would require ten months for the representative of that far-away land to come to the National Capital and get back home again. We can never have any interest in a country so remote, so difficult to reach, and so difficult to communicate with." But in the very next year there came across the wires those thrilling words, "What hath God wrought!"

The art of transmitting intelligence by electricity was born—a new era was begun. A network of wires soon spread over the land and cables were laid across the Atlantic.

Still, only places, not people, were joined together.

After a time those very practical, commonplace words, "Mr. Watson, come here; I want you," faintly came across the electric wires. That great boon—the telephone—was now given to mankind. Then there began that tremendous development and wide expansion which culminated in 1915, when the human

voice was thrown across the continent and across the seas. And tonight the strains of the "Star Spangled Banner," borne on ethereal wings, are on their way to countless havens throughout the universe.

FORECASTING THE FUTURE FORTY YEARS AGO

I hold in my hand a wonderful document. It is not a speech, only a prospectus. I should like to read it all, but there is time for only a small part of it. It is dated away back 38 years ago. A young man, then at Kensington, England, was asked to say something about the future—the *future*—of the telephone, and he prepared a most remarkable paper. I wish I had time to quote it at length, word for word, but, realizing that the hour is late, I shall give you only a small part of it, and even that not in his exact words. He says: "It is conceivable that cables of telephone wires could be laid underground or suspended overhead, connecting up by branch wires private dwellings, country houses, shops, manufacturing establishments, etc., and also connecting cities and towns and various places throughout the country." He says further: "I am aware that such ideas may appear to you Utopian and out of place, but, believing as I do that such a scheme will be the ultimate result of the introduction of the telephone to the public, I impress upon you the advisability of keeping this end in view that all present arrangements may be ultimately realized in *this grand system.*" Then he goes on with further details, and finally says: "Although there is a great field for the telephone in the immediate present, I believe there is still greater in the future. By bearing in mind the great object to be ultimately achieved, I believe that the telephone company cannot only build up a remunerative business, but also *benefit the public in a way that has never previously been attempted.*"

A document like this, if written in earlier years, dealing with subsequent events of general human interest, would have entitled its writer, when its predictions had become realities, to a place among the prophets.

This remarkable paper closes in this way:

"I am, gentlemen, your obedient servant,
"ALEXANDER GRAHAM BELL."

As the telephone art is an American art, so the telephone habit is an American habit. A few days ago I asked one of our young men to give me a few statistics. I thought that an occasion like this would not be complete without some statistics; but I asked the young man for statistics without figures, and this is what he has given me:

STATISTICS WITHOUT FIGURES

The two States of New York and Pennsylvania have as many telephones as the whole of Great Britain, France, Belgium, Italy, Serbia, and Russia combined, while Ohio and Illinois have as many as Germany, Austria-Hungary, Bulgaria, and Turkey combined.

This cautious young man puts in this note: "This alignment of States is for comparative purposes only, and is not intended to have any other significance."

The city of Chicago, with substantially the same population as Paris, has four times as many telephones as the French capital.

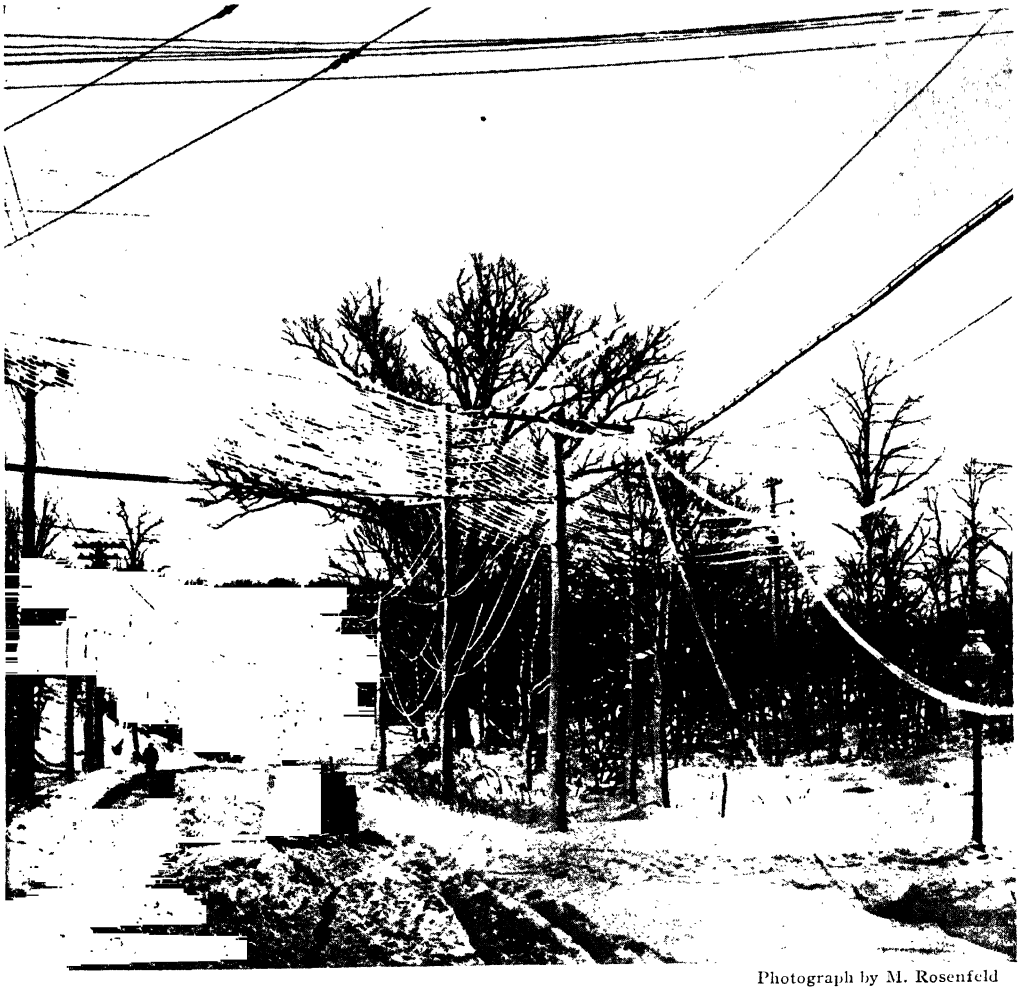
Boston and its suburbs, with about one-third of the population of Berlin and Vienna combined, have as many as both of these European capitals.

San Francisco, with substantially the same population, has eight times as many telephones as Edinburgh, while Washington, with only two-thirds of the population of Edinburgh, has more than three times as many telephones as the Scottish capital.

Here the young man inserts this note: "Apologies to Dr. Bell. Edinburgh still maintains its claim to the honor of being his birthplace. Let Edinburgh beware!"

New York City and its immediate suburbs have as many telephones as London, Brussels, Paris, Petrograd, Rome, Belgrade, Tokio, Berlin, Vienna, Budapest, Sofia, and Constantinople all combined.

NOTE.—"Here there is no indication of anything but the strictest neutrality. The comparison is between New York



Photograph by M. Rosenfeld

AN AFTER-THE-STORM SCENE ON A GREAT VOICE HIGHWAY NEAR YONKERS, NEW YORK

and its suburbs and all the capitals of all the warring nations, including Japan."

New York City alone, exclusive of its suburbs, has twice as many telephones as the whole of France, nearly one-half as many as the German Empire, and quite as many as the whole of Spain, Portugal, Switzerland, Italy, Greece, the Balkan States, Turkey, and Russia combined.

General note: The European statistics used are those of 1914, immediately prior to the outbreak of the war, when the figures, both as to telephones and population, were probably somewhat higher than they are today.

EXPENDITURES TWICE AS LARGE AS AT PANAMA

The statement closes with this item: The amount of money spent by the Bell Telephone System in construction work alone from 1906 to 1914—the period occupied in the construction of the Panama Canal—was more than twice as much as the amount spent by the United States government during the same period in the construction of the canal, exclusive of the amounts paid to the French Company and to the Republic of Panama.

In conclusion, I want to say for the multitude of people in this vast organiza-

tion that we have a wholesome respect for our trade. We like to think of it as a high and noble calling. We like to think that our army of men and women is doing a good work, making the world better, advancing civilization. It is a most exacting work, so exacting that at times we feel like the prisoner of Zenda, whose watchful guards never let him fall asleep, even for a moment.

Though exacting, it is fascinating—fascinating because each one of us sees the relation of his individual work to the work of every other one in the system and the essential relation of the whole to all other activities which, together with it, make up the work of the great pulsating world.

Last—and this is the end—it is satisfying. It is satisfying because through it all there is the spirit of service, than which there is nothing more inspiring and uplifting, because it is manifestly and preëminently of distinct and definite value to mankind, a factor in the advancement of civilization—breaking down the barriers of local prejudice everywhere and spreading mutual understanding, peace, and brotherhood throughout the world.

ADDRESS OF HON. JOSEPHUS DANIELS, SECRETARY OF THE NAVY

While we live in a day when there are some things yet to be righted in the world and some problems yet to solve, it is nevertheless a privilege of men of this generation that we live at a time when the dreams of poets, seers, and prophets have been translated into realities.

The finest things in the world are dreams. "Where no vision is the people perish," wrote one of the old seers, and another, whose vision seemed to overleap centuries and even millenniums and focus itself upon our own times, said: "Many shall run to and fro, and knowledge shall be increased."

It is indeed wonderful what some of those ancient wise men foresaw. Did Nahum get a foreglimpse of automobiles when he wrote: "The chariots shall rage in the streets. They shall jostle one against another in the broad ways; they shall seem like torches; they shall run like the lightnings."

PROPHECY FULFILLED

Coming down the ages to some of the later men and women of vision, did Mother Shipton foresee railroad trains, automobiles, wireless telegraphy, submarines, and flying machines when in 1481 she wrote:

"Carriages without horses shall go;
Accidents fill the world with woe.
Around the earth thoughts shall fly,
In the twinkling of an eye.
This world upside down shall be,
And gold be found at the root of a tree.
Through hills man shall ride,
And no horses be at his side.
Under water man shall walk,
Shall ride, shall sleep, shall talk.
In the air man shall be seen,
In black, in white, in green."

Did old Jeremiah get a foreglimpse of the aëroplane as an army scout when he wrote (Ch. 48:41): "Behold he shall fly as an eagle and shall spread his wings over Moab. Kerioth is taken, and the strongholds are surprised."

But there can be no doubt as to what Tennyson was prophesying when he said:

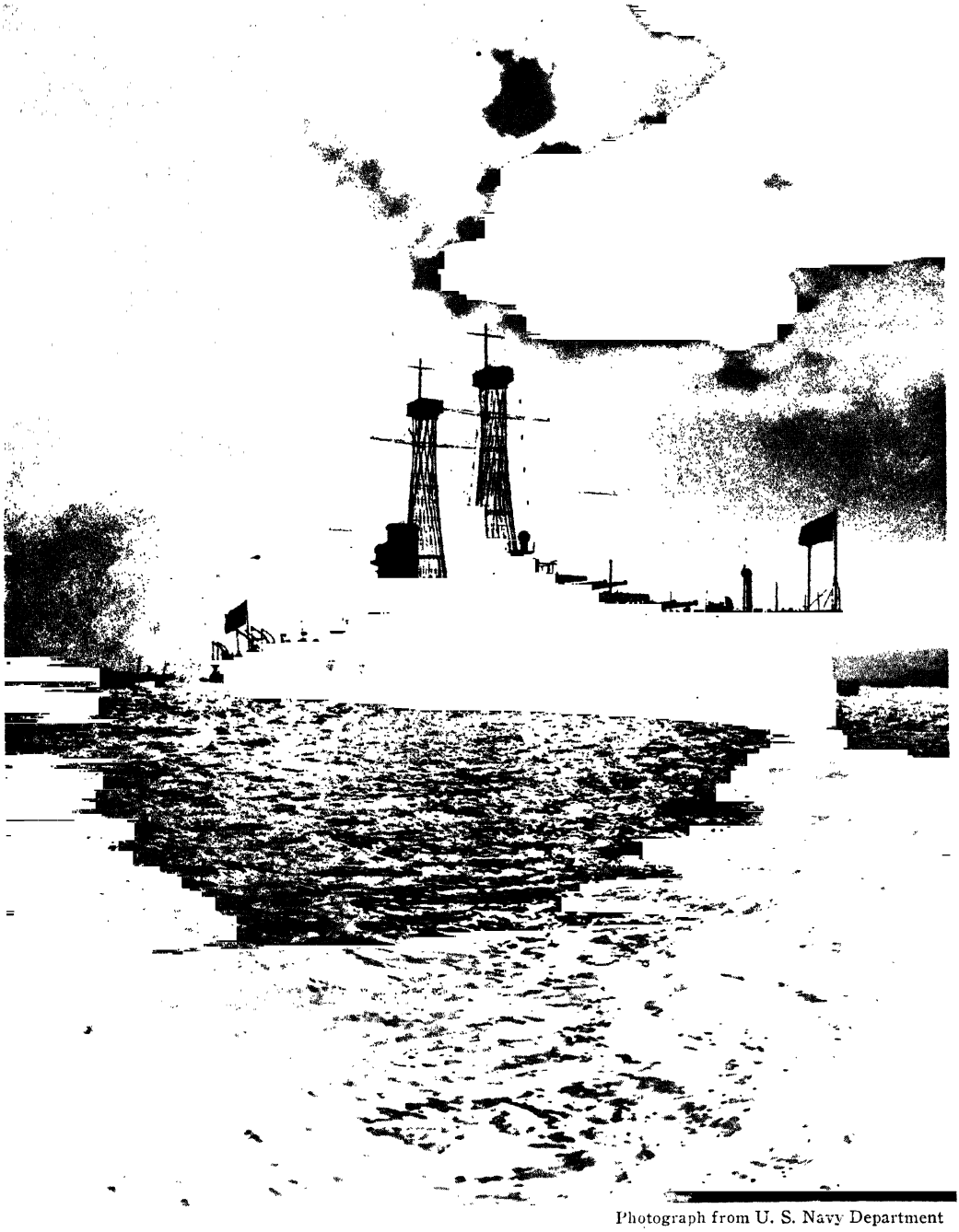
"Saw the heavens fill with commerce, argosies of magic sails,
Pilots of the purple twilight, dropping down the costly bales;
Heard the heavens fill with shouting, and there rain'd a ghastly dew,
From the nations' airy navies grappling in the central blue."

Jules Verne a few years ago stimulated the imagination when he permitted his fancies to run riot and thrilled us with what seemed stories of the impossible in his "Twenty Thousand Leagues under the Sea." What royal fiction it was and how we reveled as he gave us eyes to see ships anchoring upon coral reefs and speeding on their missions without making a ripple upon the surface of the ocean!

New discoveries and twentieth century genius have translated Verne's dream into the most deadly instruments of destruction.

In the "Lay of the Last Minstrel," Walter Scott sang of another wizard:

"In these far climes it was my lot
To meet the wondrous Michael Scott,
A wizard of such dreaded fame
That when, in Salamanca's cave,
Him list his magic wand to wave,
The bells would ring in Notre Dame!"



Photograph from U. S. Navy Department

THE FIGHTING TOP WITH ITS WIRELESS CROWN

Truly the miracle of the twentieth century has been the discovery of radio transmission; it is the marvelous fulfillment—a fulfillment which we could not believe unless we had heard it with our own ears—of the story of Michael Scott waving his wand in Salamanca's Cave and thereby ringing the chimes in the cathedral spire.

THE SPEED OF ELECTRICITY

The human voice, projected by wireless telephony, can travel around the earth about seven times in a second. One can speak to a place half way around the earth in one-fourteenth of a second.

What a marvelous thing is the human voice! The Scripture itself declares to us that the Almighty incarnated in the forerunner of the Christ, the human Voice; so that we are told that the strange prophet of the Judean deserts, who wore camel's hair and whose food was the honeycomb and the fruit of the wild locust, was "the Voice of one crying in the wilderness."

And now what a wonderful thought it is, that the human voice, with all its power, with all its influence, with all it has meant to literature and life, has, under the power of the wizard genius of man, been made to overleap continents and oceans!

"A BEATEN TRACK TO HIS DOOR"

It is to American engineers that the world owes the perfection of wireless telephony. Pursuing his studies quietly and unknown to the world for many years, Carty has written his name on the roll of honor of science. Emerson said:

"If a man can write a better book, preach a better sermon, or make a better mouse-trap than his neighbors, though he build his house in the woods, the world will make a beaten track to his door."

While the world is indebted to the engineers and scientists for the invention, it is due a further debt of gratitude to Mr. Theodore N. Vail for its adaptation to the needs of commerce and the organization and perfection of a system for rendering it useful in this way. They built upon the work of Marconi, and Marconi built upon the work of Bell and Watson.

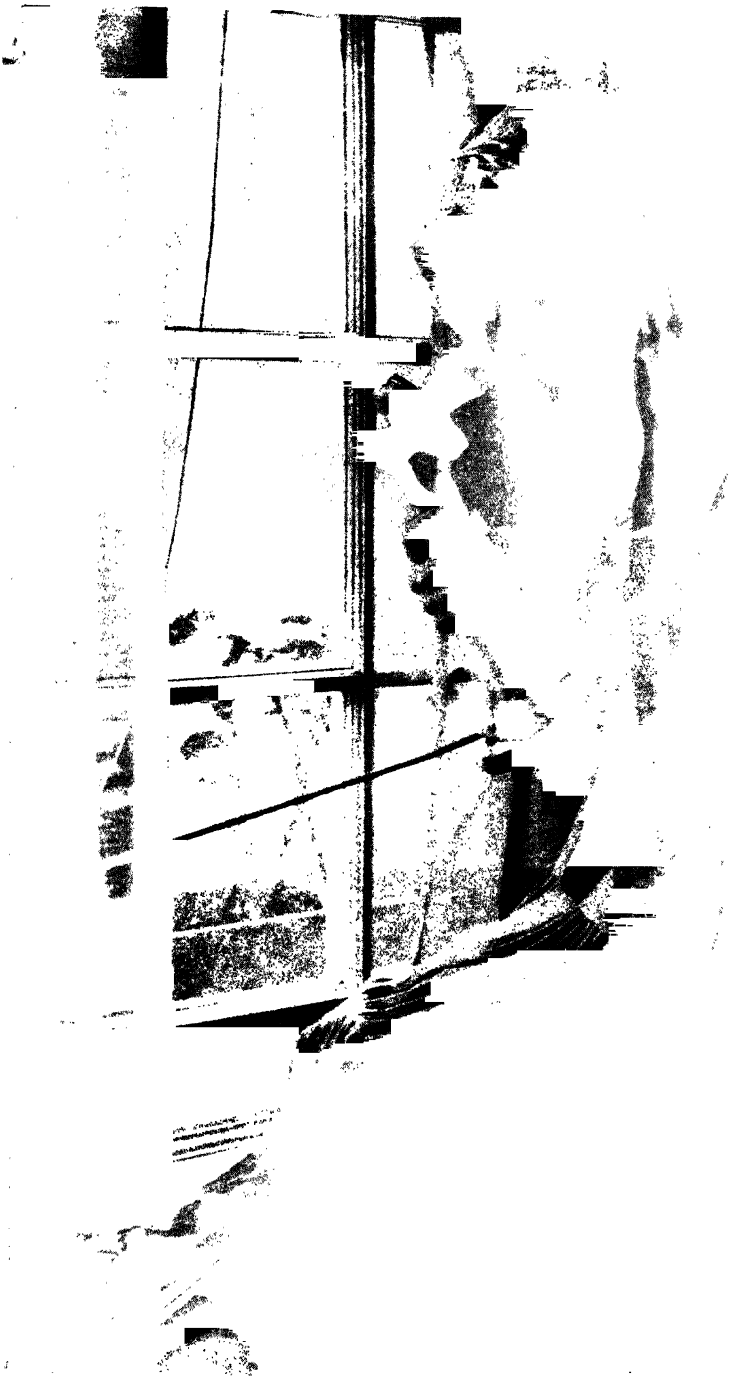
As Sherlock Holmes, the wonderful detective genius, springing from the fertile brain of Conan Doyle, had his ubiquitous and ever useful Dr. Watson, so did Alexander Graham Bell, the Sherlock Holmes of modern science, have his Watson. In capturing the marvelous secrets of nature we can hear Graham Bell give the first message ever heard over the telephone: "I want you, Watson; come here."

Only last year scientists from the old country came to Washington and, at the Naval Observatory, studied and worked with American scientists to determine the difference in latitude. Wireless messages exchanged between Paris and Washington, a distance of 3,000 miles, demonstrated the perfection reached in that wonderful field of science. It seems but yesterday that we were incredulous, as the papers brought the uncanny stories that messages could be sent from coast to coast without wires.

PERFECTING THE NAVY'S WIRELESS SYSTEM

The Navy has been a pioneer in this conquering of the waves of the air, and its high-powered stations at Arlington, San Diego, in Panama, in Honolulu, Guam, Manila, Tutuila, Alaska, etc., will shortly in very truth put a girdle around the earth, fulfilling Puck's promise "to put a girdle around the earth in forty seconds."

Working in coöperation with Mr. Carty in his remarkable achievement, was Capt. W. H. G. Bullard, U. S. N., now superintendent of the Naval Radio Service, who placed at Mr. Carty's disposal the facilities of our stations at Arlington and other places for perfecting his invention. To the Bureau of Steam Engineering of the Navy Department is due the credit of the planning and equipment of these stations in a manner which has made the radio service of the American Navy the greatest radio service in the United States or the world today. Among the officers who have been conspicuous in bringing the service to its present state of efficiency are Capt. S. S. Robison, Lieut. Commander A. J. Hepburn, and Lieut. S. C. Hooper. To the latter more than to any one else, under the direction of Rear Admiral Robert S. Griffin, is due the credit for the Navy's present system of communication. The Navy has opened 25 stations to commer-



Photograph by Paul Thompson

THE TELEPHONE GIRL

The telephone girl is no more an angel than the rest of humanity, but her patience in the face of impatience, her courtesy in the face of brusque demand, her desire to oblige in the face of ugly tempers and crusty dispositions, is wonderful. She will always "beat you to it" when you feel like smiling.

cial business, and besides that every ship of the Navy is herself a commercial station, as all private messages handled are paid for by the senders

In addition to the paid commercial business carried on by the naval radio stations, the system renders a free service of inestimable value in the daily transmission from Arlington and other stations of the time signals from the Naval Observatory, thus enabling ships at sea, even though far beyond the range of transmission of their own equipment, to determine their exact chronometer correction. Even sailing vessels, which habitually make long voyages and which have no power with which to operate a radio station of their own, may at trifling expense be equipped to catch this signal. Our own naval ships have carried it far into the Mediterranean.

In addition to this, over 300 jewelers throughout the country are now receiving the Navy's time signal by radio, and there is little doubt but what this number will grow to 3,000.

WHEN WAR'S LIGHTNINGS FLAME THE SKY

During the war in Mexico, when all land wire and cable communication between the United States and the southern part of Mexico was interrupted, the naval vessels on the west coast afforded the only means of communication. The air has been put under contribution and is now the fleet-assigned servant of man. The S. O. S. call has reduced the terrors of the deep.

Another interesting feature of this free radio service, which should be of incalculable benefit to shipping, is found in the radio compass now under construction at the Fire Island station, near the entrance to New York harbor. This device is intended to send out radio signals of such a character that a vessel in a fog may get a close approximation of her "bearing," or compass direction, from the station. By means of observations taken 5 or 10 miles apart, it should be possible for the vessel to determine her actual position with fair accuracy. This is the first installation of this type to be made in this country; but a second installation of different type, though answering the same purpose, is undergoing tests at Cape Cod.

THE WIDE WORLD TO COME WITHIN EARSHOT

The signals sent out by the radio compass at Fire Island will necessarily be limited as to range; but the Cape Cod installation will allow of a coasting ship calling the station in the usual manner from any distance within the ship's ordinary range and receiving a definite reply as to her bearing from the station. In the case of Fire Island the ship will determine her bearing from the character of the signals continuously emitted; for Cape Cod the station determines the bearing of the ship from her calling signal and sends the information back. If these installations prove as successful as anticipated, the radio operators of ships will become an important part of the navigating force.

In the fall of last year the human voice was successfully transmitted by radio from the Naval Radio Station at Arlington clear across the continent to the station at Mare Island, Cal., 2,500 miles away; and several months later, sitting at his desk in the Navy Department, the Secretary of the Navy sent the first order ever issued by the Navy by wireless telephony to Rear Admiral Usher, commandant of the New York Navy Yard.

The radio system of the Navy has been so thoroughly and completely organized and the Navy's system of communication, under the efficient organization of the Office of Naval Operations by its present chief, Rear Admiral Benson, is now so effective that messages to every part of the world can be sent at any time of the day or night; and this division has been put under the supervision of a thoroughly trained naval officer, within 50 feet of the desk of the Secretary of the Navy, and in immediate touch with the officers and officials of every department.

NOTE TO MEMBERS

Owing to unprecedented conditions in the importation of special inks for color work, together with the very large increase in the edition of the NATIONAL GEOGRAPHIC MAGAZINE, due to its continually growing popularity, it has been necessary to postpone until the April number the thirty-two pages of four-color work, illustrating the article on "America's Playgrounds," which was announced for the March number.

VOL. XXIX, No. 4 WASHINGTON APRIL, 1916

THE NATIONAL GEOGRAPHIC MAGAZINE

THE LAND OF THE BEST

By Gilbert H. Grosvenor

Author of "Young Russia, the Land of Unlimited Possibilities"

RARELY has there been afforded a more impressive illustration of the statement that it pays to advertise than is to be found in the story of the endless stream of tourists hastening to Europe during the several decades before the great war.

The appeal of the art treasures and associations of the Old World, which is the original home of all Americans, is really not sufficient explanation of the fact that until last year 100 American tourists were crossing the Atlantic to one American tourist who crossed the United States. The delightful literature which the European travel bureaus and steamship companies placed at our disposal so whetted our appetite for a view of the lakes of Ireland and Scotland, of the castles on the Rhine and Danube, of the scenes made famous by Shakespeare, Dickens, Victor Hugo, and Goethe, that we turned our back upon scenery more beautiful, wild flower gardens and forests incomparably finer, mountains more superb, and lakes more radiant than any to be seen in the lands across the Atlantic.

It is true that one finds a more ancient culture in Europe. It is also true that he finds more splendid architecture. And likewise it is true that he finds there better art; for before America was born into the family of nations Europe had castles and cathedrals and masterpieces of art and sculpture.

But in that architecture which is voiced in the glorious temples of the sequoia grove and in the castles of the Grand Canyon, in that art which is mirrored in American lakes, which is painted in geyser basins and frescoed upon the side walls of the mightiest canyons, there is a majesty and an appeal that the mere handiwork of man, splendid though it may be, can never rival.

Nor is our country lacking in hallowed and historic spots. Is Waterloo, where Napoleon's star of empire set forever, any more sacred to the American heart than Appomattox, where a new nation was born out of the throes of internecine strife? Are Austerlitz and Wagram, with their high tides of the French Empire, of soil more sacred, of atmosphere more hallowed than Valley Forge and Gettysburg, Plymouth Rock, Independence Hall, and Mt. Vernon? Does London or Paris or Berlin contain more of inspiration to us as a people than Washington, the Nation's Capital?

We have wandered far to find the picturesque and the magnificent, and yet it is not entirely a provincial philosophy which says that New York is in many ways the most wonderful, the most striking, and the most interesting of all the cities of the earth; neither is it only the voice of the man who has never seen other shores that pronounces Yellowstone Park the most marvelous picture-book



STONE BRIDGE OVER ...E SUSQUEHANNA RIVER AT ROCKVILLE, PENNSYLVANIA

One might travel all over Europe without seeing a ...e picturesque landscape than this, or a more successful combination of art and nature in a single scene

of Nature's library; nor yet is it the narrow pride of the spread-eagle orator alone that awards to the Grand Canyon and the Yosemite and the Big Trees first place among the wonder scenes of the earth.

Luray Cave, in Virginia, and the Mammoth Cave, in Kentucky, surpass in originality and grandeur any caves in Europe, while Niagara Falls has no rival in Europe or in Asia, and our American forests are the glory of the world.

Man goes to Asia and to Africa to study forgotten civilizations, when the Redskins upon our own Western plains and in our own cliff dwellings reveal stories of the past as strange as any we know, and constitute a race more magnificent in physique than any that can be found in other parts of the world.

When one comes to examine the literature of America for the tourist, one is amazed at the contrast between that literature and what he finds from other countries. Baedeker publishes a guide-book in three volumes to tell about Italy, and one volume to tell about the United States and Mexico. One can find more literature about the geysers of New Zealand than about those of the Yellowstone (though the Yellowstone contains more geysers than all the rest of the world); more about the troglodytes of northern Africa and Asia Minor than about the cliff-dwellers of Arizona and New Mexico, though the latter were much more ingenious and more amazing in their achievements.

As it would require more space than there is between the covers of this Magazine merely to index all the places of scenic and historic interest in our country, in this article we must content ourselves with mentioning in text and picture only a comparatively few. Remember, that the United States, excluding Alaska, is as big as England, Scotland, Ireland, France, Germany, Spain, Portugal, Italy, Austria-Hungary, the Balkan States, Switzerland, Holland and Belgium,



Photograph by Edwin H. Lincoln

"THE BAREFOOT BOY WITH CHEEKS OF TAN"

This young man cut his "fishin' pole," dug a can of worms, gathered up his basket, and then said: "Mother, how many do you want?"



Photograph by Edwin H. Lincoln

THEIR LAST PORT: NEW BEDFORD, MASSACHUSETTS

Whalers *Rousseau* and *Desdemona Rousseau*, built in 1802 by Stephen Girard, of Philadelphia, and used at one time as packets between Liverpool and Philadelphia. The fortunes of most of New Bedford's leading families were founded on whale oil and "bone," and every tradition of the town has a whaling background.



Photograph by Edwin H. Lincoln

LOMBARDY POPLARS ON ROAD BETWEEN LENOX AND PITTSFIELD, MASSACHUSETTS

Pittsfield's Public Green has been called "the heart of the Berkshires," and Lenox has been christened "the gem of the mountains." Between them stretches miles of scenery, with old Greylock in the distance, as pastoral in its charm, as soft in its beauty, as inviting in its appeal as anything that Europe can offer.



Photograph by Edwin H. Lincoln

A NEW ENGLAND VILLAGE

Do the rural communities of England or France contain anything more graceful or picturesque than our American elms



THE LANCASTER ELM, THE LARGEST IN MASSACHUSETTS

Several of our States already are pointing the way that all of them are certain to travel in the future. Mountain tops, historic sites, battlefields, and other places of scenic and historic interest are being acquired by the State and reserved for the public.

Norway and Sweden, and European Russia, excepting the provinces of Archangel and Perm.

PICTURESQUE AND HISTORIC NEW ENGLAND

Boston—with its rich history of Colonial days, its brave leadership of Revolutionary times, its appreciation of culture in the years when our people were so deeply absorbed in the problem of conquering the wilderness and building a nation—takes on a new meaning when one has visited its Commons, passed in and out of the portals of Faneuil Hall, made a pilgrimage to its old churches and the burying ground where lie the ashes of Hancock, Adams, and Paul Revere.

Already more than 50,000 people annually journey to the town of Plymouth to pay reverent homage to the memory of the *Mayflower*. Plymouth Rock is now appropriately cared for. On the hill near by rises a beautiful monument, which the nation has erected to the memory of those who risked their all to come to America in that pilgrim craft. It is said that the splendid statue of Faith which crowns this monument, and which is 40 feet high, is the largest stone figure in the world.

Plymouth Rock can never mean as much to the American who has not seen it as it does to him who has stood on Plymouth's sacred soil and felt the thrill of the spirit of those who fashioned here a cradle of modern liberty.

A hundred and one delightful and rest-



A NEW HAMPSHIRE HARVEST SCENE, WITH CHERRY MOUNTAIN IN THE DISTANCE



When the broad elm, sole empress of the plain, whose circling shadow speaks a century's reign,
Wreathes in the clouds her regal diadem— a forest waving on a single stem.
—*Oliver Wendell Holmes.*

The trees of America are the best God ever planted. Vast stretches of them have been cleared, but our forests still contain the largest, most varied, most fruitful, and most beautiful trees in the world. Wide-branched oaks and elms in endless variety, walnut and maple, chestnut and beech, sycamore and locust, along the coast of the Atlantic; to the southward, dark, level-topped cypresses, sparkling spice trees, magnolias and palms, glossy-leaved, blooming, and shining continually; to the northward, white pine and spruce, hemlock and cedar; westward, oak and elm, hickory and gum, ash, linden, laurel and pine, juniper, cactus and yucca; westward still further, new species of pine, giant cedars and spruces, silver firs and sequoias, "kings of their race."—JOHN MUIR.

ful places in Maine beckon the tourist, from the rock-bound island of Mt. Desert, on its southern shore, to the primeval forests of its northern woods.

One who visits New England without going to the top of Mt. Washington, the culminating peak of the White Mountains, misses one of the charming experiences which that part of our country, famous alike for its history and its scenery, has to offer. He who reaches the summit of that lofty peak journeys as far north in temperature and in flora as Greenland. From the Observatory one may look north, south, east, and west, the only limit to the view in any direction



JUST FROST! MOUNT WASHINGTON, NEW HAMPSHIRE, SEPTEMBER 30, 1915

A combination of an exceptionally heavy frost and a strong wind one morning last September transformed the end of the railroad trestle and the little stage office on the top of the mountain into fairy structures of glistening white.



Photographs by Guy L. Shorey

MOUNTS ADAMS AND MADISON FROM CORTES NOTCH TRAIL: NEW ENGLAND

One does not have to travel across the continent to find mountain-climbing steep and rugged enough to gratify all but the confirmed Alpinist



Photograph by Edwin H. Lincoln

THE VALLEY OF THE HOUSATONIC, WITH GREYLOCK IN THE DISTANCE: PITTSFIELD, MASSACHUSETTS

This valley has contributed the marbles out of which some of America's most noted structures have been built. The Nation's Capitol, at Washington, and the City Hall, at Philadelphia, share with St. Patrick's Cathedral, at New York, the common origin of their marbles. Old Greylock, "cloud girdled on his golden throne," is the highest mountain in Massachusetts.

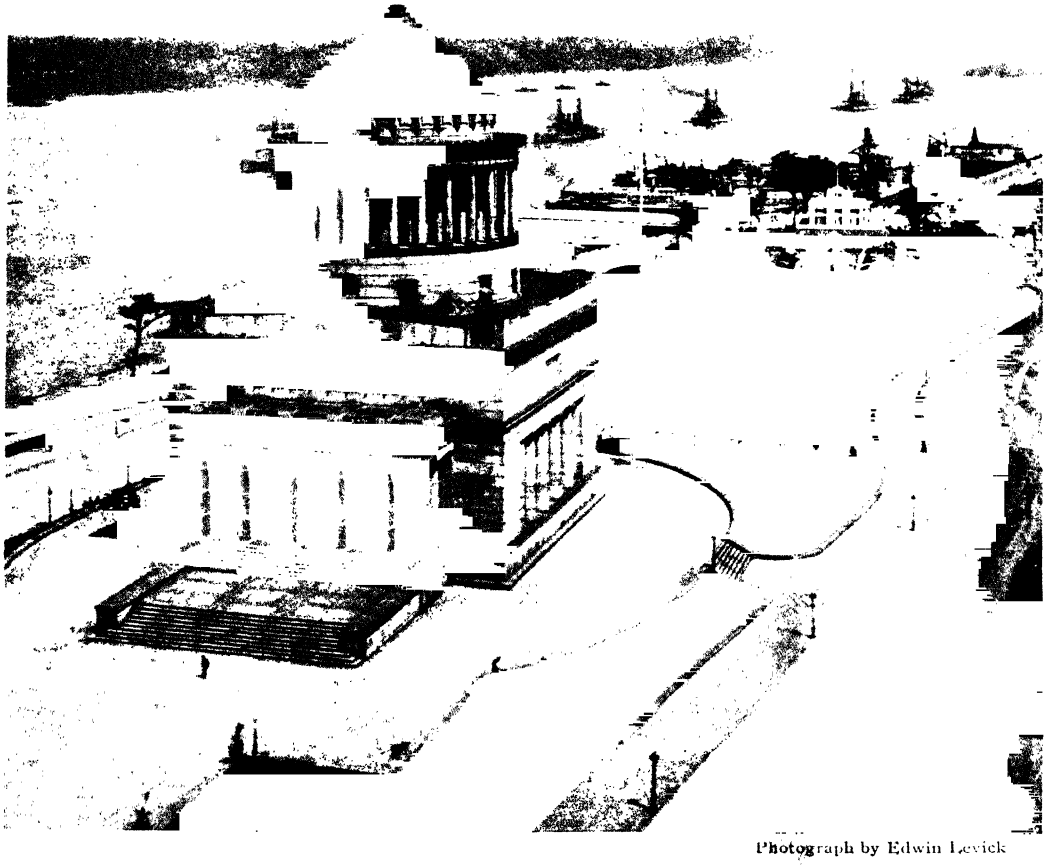
being the power of the eye to penetrate the distance. Northward, one looks into Canada; eastward, into Maine; southward, across New England; westward, into New York.

It was Henry Ward Beecher who said of the autumnal foliage of the Berkshire Hills: "Have the evening clouds, suffused with sunset, dropped down to become fixed into solid forms? Have the rainbows that followed autumn storms faded into the mountains, and left their mantles there? What a mighty chorus of colors do the trees roll down the valleys, up the hillsides, and over the mountains!"

These hills constitute one of the foremost playgrounds of the eastern United States. Their roads are as good as the Appian Way ever was in the palmiest days of the Roman Empire.

And he who journeys southward from them comes down the verdant valley of the Connecticut, the central portion of that charming little State of which De Tocqueville on his visit proposed his remarkable toast: "And now for my grand sentiment: Connect-de-coot, ze leetle yellow spot zat make ze clock-peddler, ze school-master and ze Senator; ze first give you time, ze second tell you what to do wiz him, and ze third make your laws and civilization."

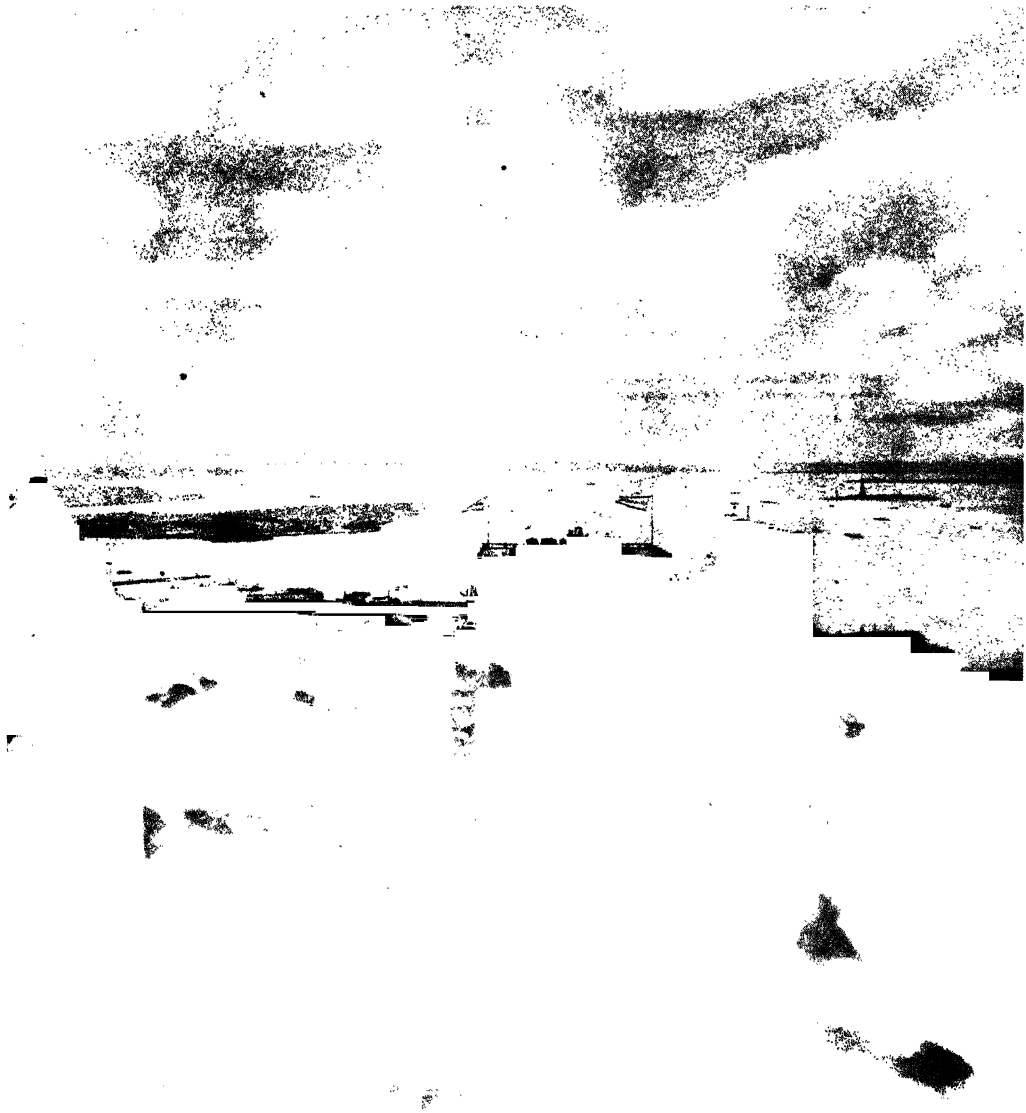
New Haven and Cambridge are two spots that must ever be hallowed in American history, for who can estimate the nation's debt to the two old uni-



Photograph by Edwin Levick

GRANT'S TOMB, NEW YORK CITY, SHOWING THE HUDSON WITH THE ATLANTIC FLEET RIDING AT ANCHOR

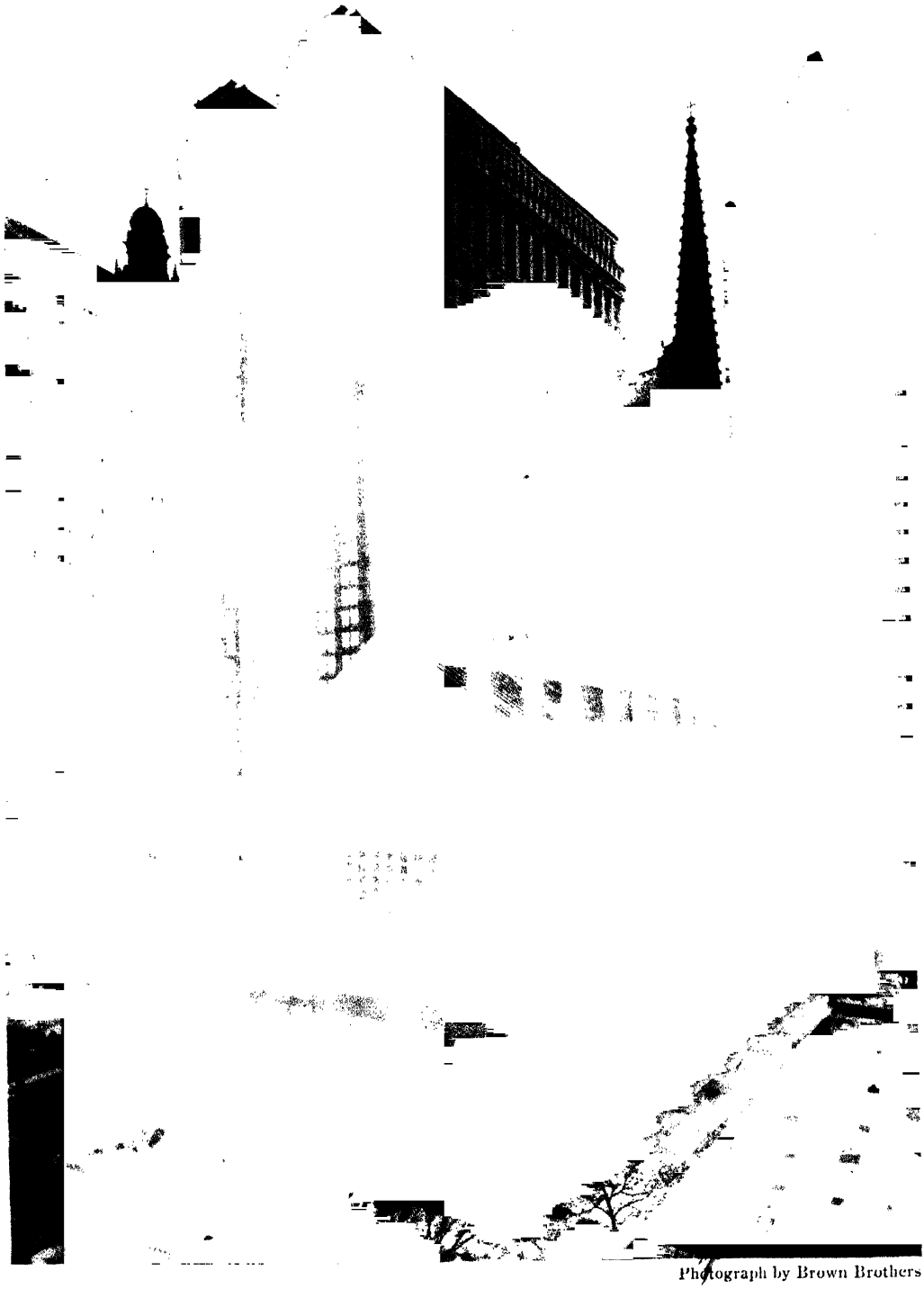
Next to Central Park, where broad acres of the most expensive land on earth present a velvety expanse of green, and great rocks, surrounded by carefully tended shrubbery and graceful trees, retain their rough natural beauty, the most inspiring "breathing space" is perhaps Riverside, which occupies a considerable proportion of the shore of the Hudson north of Seventy-second street. From this park a fine view of the Hudson River may be had, and within its confines is located the stately tomb of General U. S. Grant, which is to New York what the tomb of Napoleon is to Paris.



Photograph by Brown Brothers

THE TOP OF THE BUSINESS WORLD: LOOKING FROM THE WOOLWORTH BUILDING PAST THE BATTERY TOWARD THE SEA

It takes no undue amount of national pride to accept New York as the world's foremost metropolis. London may be hundreds of years older and bigger; Paris may surpass it in art and architecture; Berlin may hold the better of the argument in "newness," but nowhere else on the face of the earth is there a city of such many-sided greatness as New York. Its port does more business, its banks have heavier clearings, its immigrant station has more incomers, its streets are trod by a more polyglot population, its urban railroads handle more traffic, its bridges carry more people, than any other city of Christendom.



Photograph by Brown Brothers

AN OASIS OF RELIGION AMID A DESERT OF BUSINESS

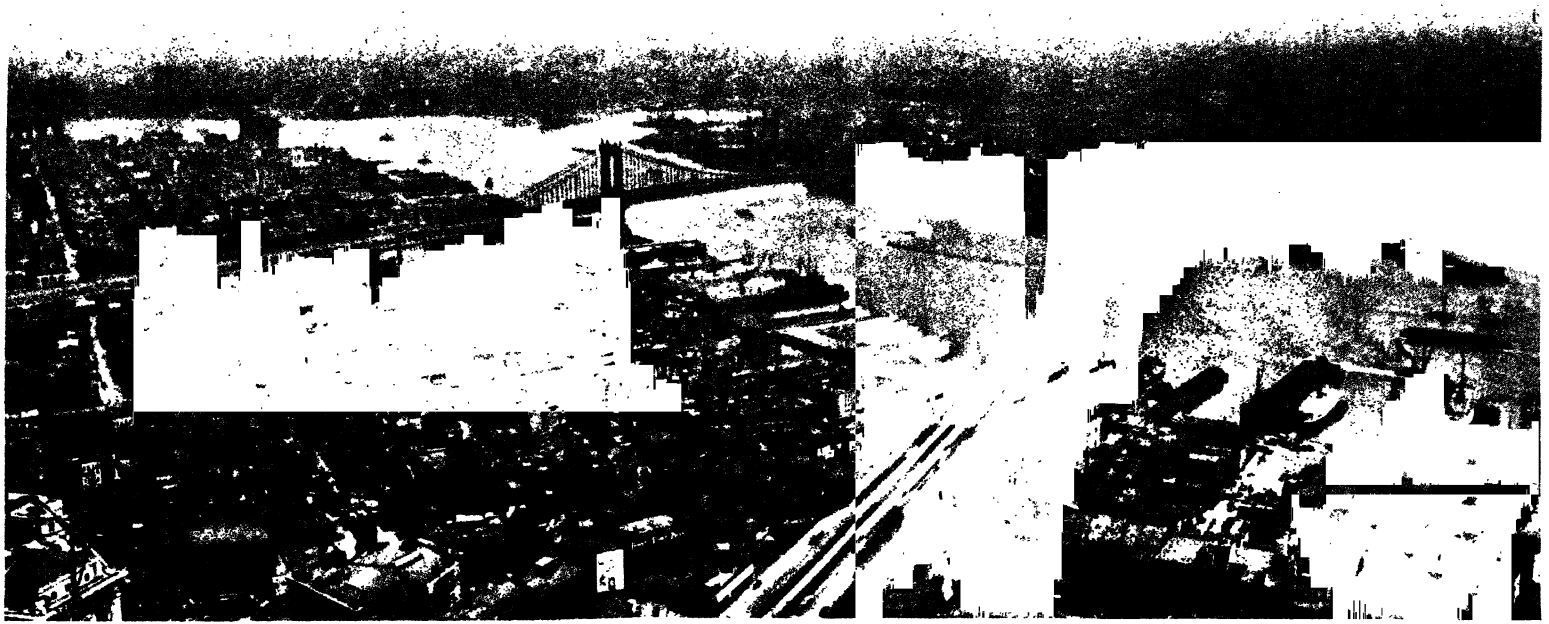
Trinity Church, New York, standing at the head of Wall street, its tower, looking down on America's financial center, seems a hand raised to heaven in an appeal that men may not, while absorbed in the struggle of the "Street," forget their God.



Copyright by Edwin Levick

LOOKING DOWN UPON A FOREST OF SKYSCRAPERS: NEW YORK CITY

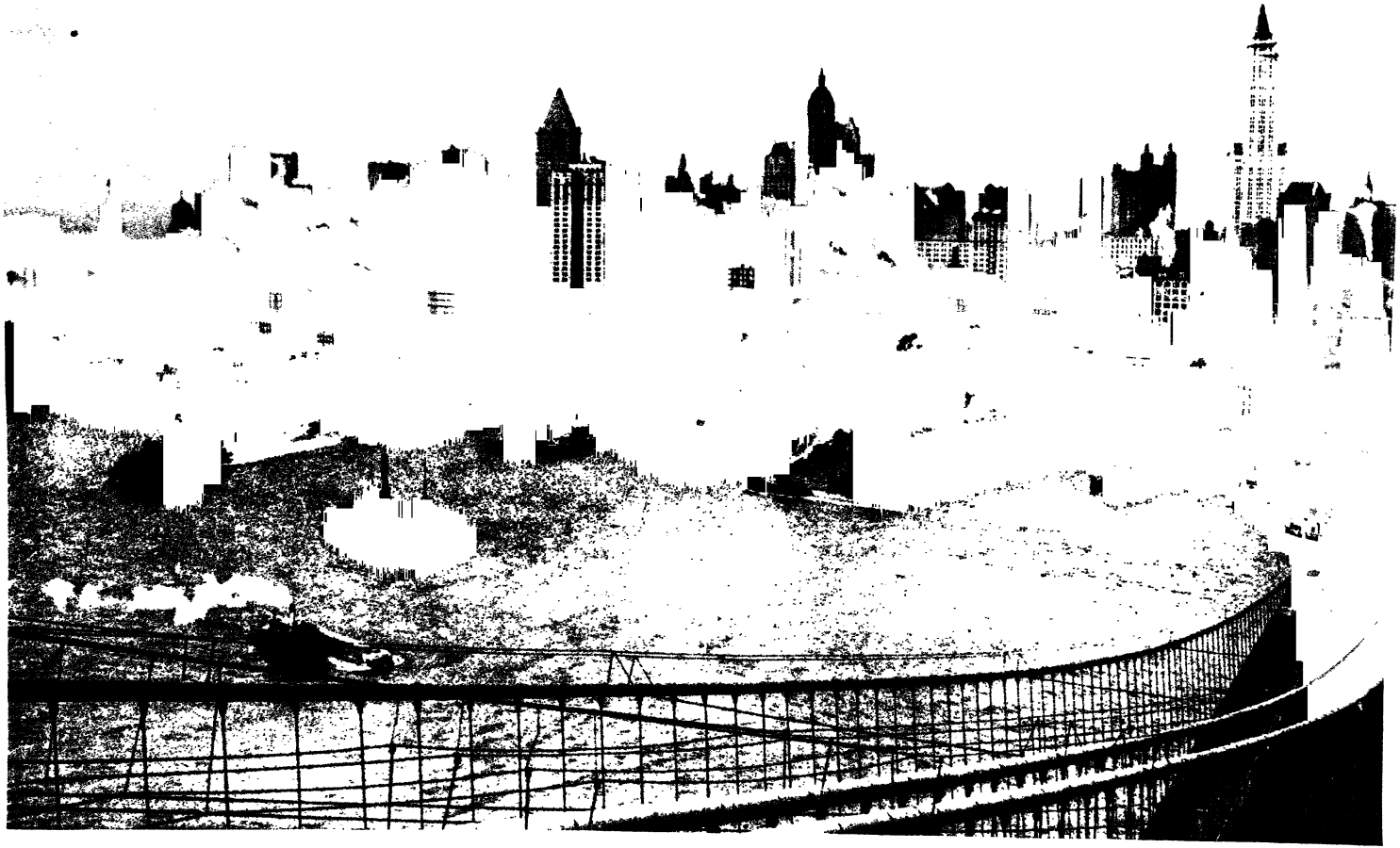
Upon the top of one of these man-made mountains there is the same peaceful quiet as on any mountain top. No sound from the streets below comes up this distance. Men on the sidewalks are infinitesimal dots, darting hither and yon. Looking down upon them, one is inclined to reflect what puny beings humans are, and from this lofty point of view almost forgets his sympathy for their personal interests. Then comes the realization that this mountain was built by these puny beings from materials dug out of the earth in a crude state, purified, shaped, and fastened together in a manner that will make it stand practically for all time, and then a feeling of reverence for the human brain—that God-given boon which has made these things possible. Note the men on the tower in the foreground.



Photograph by Edwin Levick

WHERE ELSE IN THE WORLD DO CITY BLOCKS APPEAR SO SHORT AND BRIDGES SO LONG?

Five enormous steel bridges span the East River. Their combined cost was half as much as the Panama Canal. Three of them are suspended from cables the wires of which, if placed end to end, would more than twice girdle the earth. If placed side by side, these five great structures would provide a roadway as wide as the Washington Monument is high, and if placed end to end they would make a great bridge over six miles long. Over the Brooklyn Bridge alone 125,000 surface cars travel every twenty-four hours, with other vehicular traffic in proportion. The new Hell Gate Arch Bridge, to be opened about January, 1917, will carry four tracks of the New York Connecting Railroad, facilitating the service of at least two great lines.



Copyright by Edwin Levick

IF PETER MINUIT COULD SEE THIS, WHAT WOULD HE SAY?

Peter Minuit, the first Dutch governor, who is said to have bought Manhattan Island from the Indians in 1626 for about twenty-five dollars in red cloth and beads, would now be able to sell it in city lots for something like $3,000,000,000. Peter probably bought more wisely than he knew, however, for it is not likely that he dreamed of office buildings half a hundred stories high, and never investigated the foundation possibilities of the island, the solid rock of which makes it possible to build the city so far up into the sky.



Photograph by Edwin Levick

"AW COME ON IN—THE WATER'S FINE"

New York policemen develop bad eyesight in the vicinity of park fountains on hot days, and those young Americans who play such an important part in the publishing business, distributing hundreds of thousands of newspapers, realize the visual deficiencies of these guardians of law and order. The bluecoat saunters off to the farthest corner of his beat and the boys jump into the fountain.



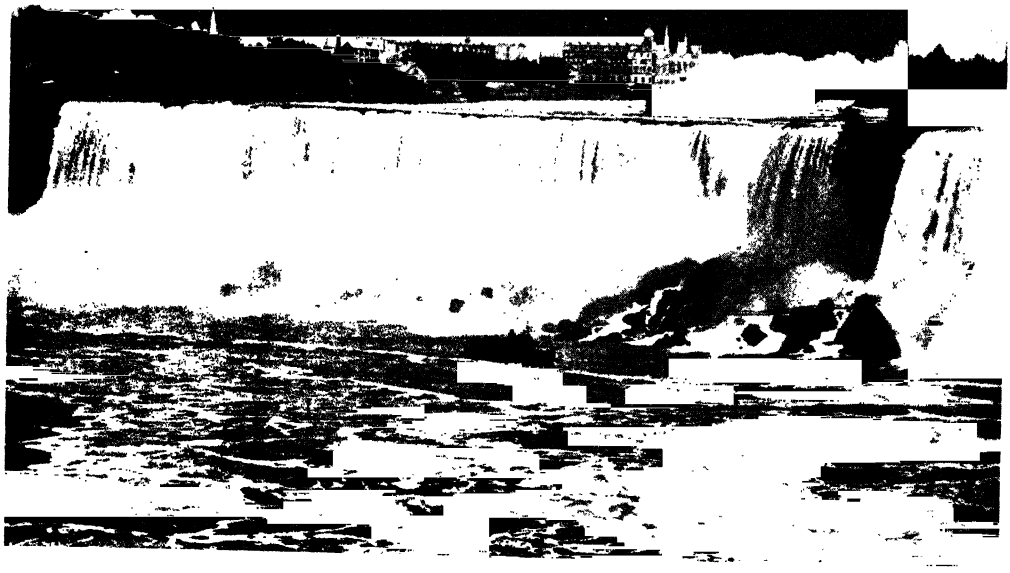
THE PALISADES OF THE HUDSON, NEAR ALPINE, NEW JERSEY

Photograph by J. B. Allison

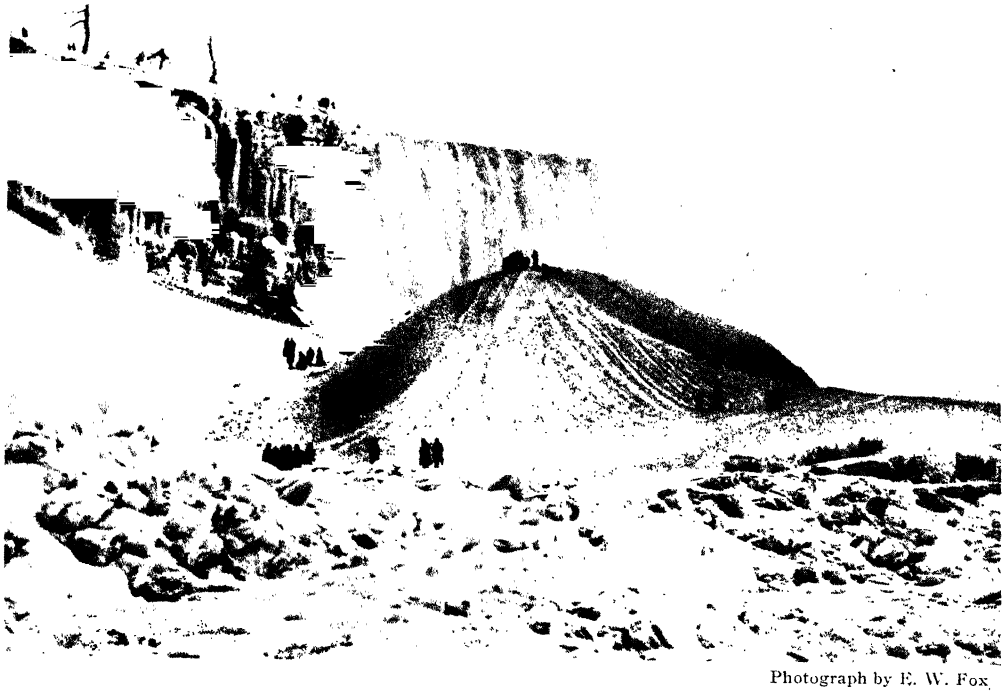
One cannot too heartily commend the spirit that citizen and State alike displayed in the preservation of the Palisades along the New York-New Jersey shore of the Hudson River. It seemed that the trap-rock quarryman was going to forever ruin their beauty, and that the continued acquisition of lands along the Hudson for private purposes was destined to deny to the public at large free access to the shores of the American Rhine. But in 1900 New Jersey and New York took joint action for the acquisition and dedication to the public of 10,000 acres along the banks of the river and the creation there of an interstate park. Ten years later Mrs. Edward H. Harriman and many other public-spirited people joined hands with the two States and acquired 10,000 acres more.



NIAGARA FALLS, CIVILIZATION'S SUPREME SPECTACLE IN WATER



THE AMERICAN FALLS: NIAGARA



Photograph by E. W. Fox

IN THE GRIP OF THE ICE KING: NIAGARA FALLS

Though Niagara is awe-inspiring and soul-conquering in its thundering power, the silent, noiseless, eerie army of the Ice King sometimes steals upon it, stills its thunders, and transforms its plunging waters into solid masses of ice.



Photograph by Charles R. Martin

THE WASHINGTON MONUMENT, LOOKING ACROSS TIDAL BASIN FROM THE POTOMAC

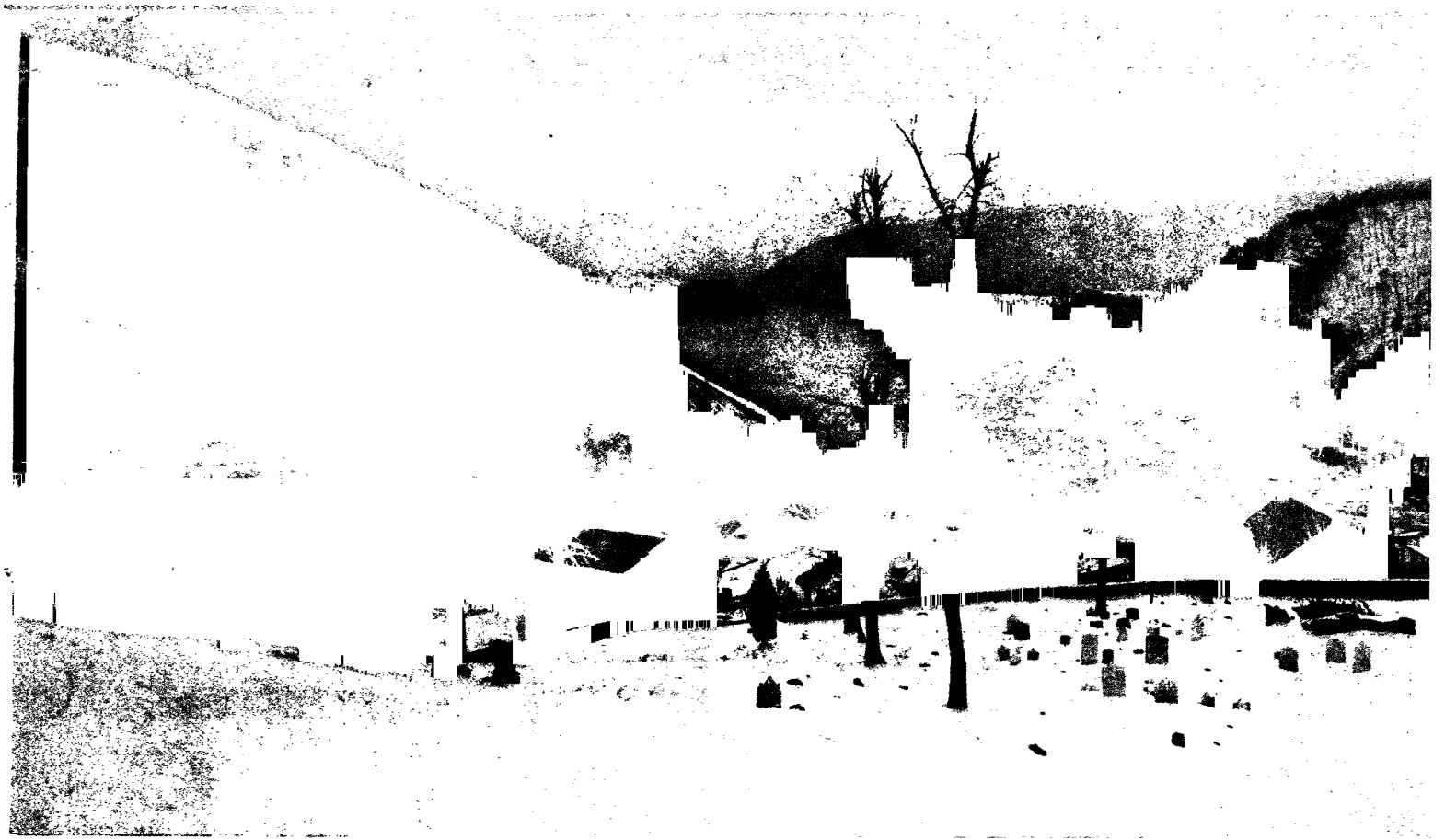
Expositions come and expositions go, but there is one great exposition that is always in season, perennial in its beauty, enduring in its interest, and rich in its exhibits; the nation's capital is an "always open" exposition of American history and American achievement. Weeks can be spent profitably within the shadow of the Washington Monument, visiting the great exposition halls which have not been built for a month or a year, but to endure for time to come.



THE CAPITOL AT WASHINGTON AFTER A SNOW-STORM

Photograph by Charles R. Martin

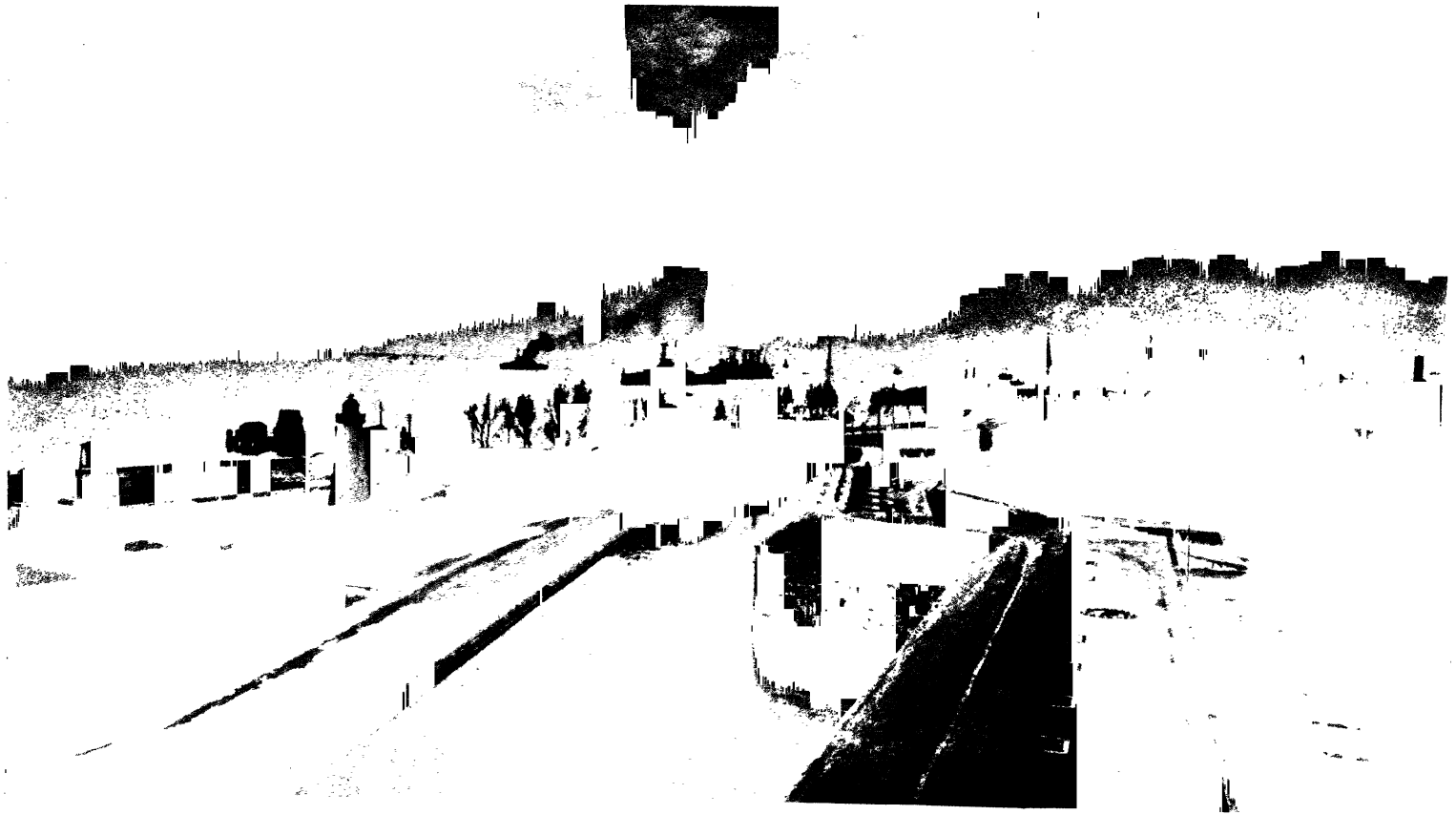
Underneath this imposing dome the laws of the nation are enacted by Congress, having now a membership of between five and six hundred representatives from the forty-eight States. Under it also sits the United States Supreme Court—the Federal tribunal of last resort. It represents the beginning and the end of law. Every tourist ticket should read via the nation's capital.



Photograph by Eugene J. Hall

THE TOWN OF JOHN BROWN'S RAID: HARPERS FERRY, WEST VIRGINIA

Where the Shenandoah, called by those who live in its famous valley "fair daughter of the skies," joins the Potomac at Harpers Ferry they **make a picture** of seldom-exceeded natural beauty. Jefferson called the gorge through which the Potomac passes the Blue Ridge Mountains "one of the most stupendous scenes in nature." Of course, if he had seen the Grand Canyon, the Yellowstone National Park, Yosemite, or the Royal Gorge, he would not have put it so strongly; but Harpers Ferry none the less is a bit of scenery which a whole nation may well treasure



A VIEW OF FORT MONROE AND OLD POINT COMFORT, VIRGINIA

Photograph by George F. Adams

In no territory of like extent in the United States is more historical interest gathered than in that which borders Hampton Roads. Here was planted the first English colony in America; here was held the first gathering of the people's representatives to make their own laws; here were erected the first fortifications in the English-speaking New World; here was fought the land battle that terminated America's War of Independence and the naval battle that revolutionized the warfare of the sea. The first fortifications where Fort Monroe now stands were built 305 years ago, in 1611. Since that time, with short lapses, there has been some sort of a fortification always guarding the entrance to Chesapeake Bay. Rich in history, balmy in climate, charming in prospect, the Old Point region has entertained its hundreds of thousands with Virginia hospitality.



THE MAIN STREET OF YORKTOWN, VIRGINIA, WHERE CORNWALLIS SURRENDERED TO WASHINGTON IN 1781, NEAR THE MOUTH OF THE YORK RIVER, 33 MILES FROM NORFOLK

The house on the left was the first custom-house in America. The ox-cart is still more in evidence than the automobile. Here stands the house of General Nelson, the Virginia patriot, who offered twenty guineas to the first cannoneer who would hit his house, saying that it meant nothing to him while it harbored the enemy of his country—Cornwallis. And a cannon-ball embedded in the chimney tells a story of good gunnery.

versities which honor the names of their founders, Elihu Yale and John Harvard? Surely Oxford and Cambridge have rendered no more conspicuous service to Europe than Harvard and Yale to America!

And there are many other college communities whose halls are fragrant with traditions more inspiring to Americans than any of the memories associated with the university buildings which tourists visit in Europe — William and Mary, where Jefferson and Monroe were college boys; the University of Virginia, founded by Jefferson; Princeton, the university which graduated Madison and where Joseph Henry taught.

THE EMPIRE STATE

From its metropolis in the southeast to Niagara on the west, from Plattsburg on historic Lake Champlain to picturesque Lake Chautauqua, the Empire State is full of lure for the traveler. New York City is the most cosmopolitan community of the earth. There are more Jews in it than in Jerusalem, more Italians than in Messina, more Germans than in Bremen, and more Slavs than in Kishinef.

Some one has said that New York is a city that is all things to all men; that the artist translates it in terms of beauty, the practical man in terms of efficiency. He adds that everywhere it is spectacular, the big setting of a big drama, a place of endless experiment and achievement, the city of skyscrapers, whose elevators convey one with the speed of an eagle to dizzy summits, from which those who walk the narrow street below seem like so many ants following their daily toil.

To the Hudson River many a world traveler has paid tribute. George Wil-



Photograph by H. C. Mann

BRUTON PARISH CHURCH: WILLIAMSBURG, VIRGINIA

Bruton Parish Church was built in 1710 and is the oldest church in continuous use in the United States. It was more intimately associated with colonial history than any other building in Virginia. Five Presidents of the United States—Washington, Jefferson, Madison, Monroe, and Tyler—worshipped here, as did also all of the colonial governors and the members of the House of Burgesses for three-quarters of a century. Among its interesting relics are the Jamestown baptismal font and communion service.

liam Curtis declared that "the Danube has in part glimpses of such grandeur, the Elbe sometimes has such delicately penciled effects, but no European river is so lordly in its bearing, none flows in such state to the sea. Of all our rivers that I know, the Hudson, with its grandeur, has the most exquisite episodes; its morning and evening reaches are like the lakes of a dream."

The trip from New York up the Hudson is one of rare delight, whatever the season, for between the magnificent country estates and the history and legends of Tarrytown and Sleepy Hollow, of West Point and the Catskills, there is romance and entertainment in every mile. But when autumn comes, and the trees reach their unanimous verdict that the colors of the rainbow should be matched by the colors of their foliage, the traveler upon its waters might well "doubt if Eden were more fair."

The Adirondack region, stretching from Canada down almost to the Mohawk Valley and from Lake Champlain to the St. Lawrence River, will ever claim the loyal admiration of the tens of thousands who visit it. The beauty of its intricate chain of lakes, the solitudes of its deep wilderness, and the magic of its flaming chasms linger in the minds of all who have wandered there.

Upon the southeastern border of these mountains lies Lake George, a gem in a setting of mountains. The Italian thinks



Photograph from M. L. Alexander

THE WASHINGTON OAK, THE LARGEST LIVE-OAK IN THE WORLD: AUDUBON PARK, NEW ORLEANS, LOUISIANA

The gnarled, wide-branched oaks and the funereal Spanish moss are not confined to Louisiana's vast virgin forests. They come right down into the city, and one who rides through Audubon Park and feels its restful spell cannot but accept, at least in part, New Orleans' proud boast that she is the "city that care forgot."

of it as Como, the Englishman as Windermere, and the Scot as Katrine, for it possesses much of the enchantment of each of these famous waters.

In central New York are to be found those remarkable lakes which we know as Oneida, Cayuga, and Seneca.

The culminating spectacle of the East, by unanimous consent, is Niagara Falls. The Indians described it in a phrase than which no word-painter has ever found one more expressive. They called it the "Thunder of Water." Niagara is without a setting. Some scenes gather as much from their surroundings as they themselves possess; like a mirror, they borrow some of the loveliness we behold in them from other sources. But Niagara has all its beauty and sublimity within itself. There is nothing of charm or attraction in the approach to it from whatever direction.

Just as the United States is setting aside national parks and national monuments in the West for the benefit of the generations that shall come after us, so New York, in particular, is making reservations, historic and scenic, for the benefit of her people.

The American Scenic and Historic Preservation Society is incorporated under the laws of that State and has been intrusted with the custody of most of these places. It annually makes a report to the Governor, showing what steps are taken, and has labored with unusual success in its field. Letchworth Park and Fort Ticonderoga, the one an example of



Photograph by Hypo Coquille

UNCLE EPH'M AND HIS OLD GRAY MULE IN FROM THE COUNTRY: BAYOU SARA, LOUISIANA

This is a surviving touch of the old South, of the days of "My Old Kentucky Home," "Suwanee River," and "Old Black Joe"

the places of natural beauty and the other of the places of historic associations, are under its control.

INDEPENDENCE HALL AND VALLEY FORGE

The State of Pennsylvania has her share of shrines. In Philadelphia there is Independence Hall, than which there is no more hallowed edifice in Europe or America, for it was in this old brick building that democracy had its birth. Surely no place in Europe holds as just an appeal to the lover of liberty.

And then there is Valley Forge, set aside by the State of Pennsylvania as a park. How can Americans better comprehend the sufferings and sacrifices out of which our nation was born than to go to Valley Forge, and there on the very ground read the story of that cruel winter which moved the Father of His Country to tears!

Within a few hours from Philadelphia, Baltimore, or Washington is the battlefield of Gettysburg, listed by the historian Creasy as one of the fifteen decisive battles of all time. As you make your pilgrimage to the sacred field through Mary-



CHATTANOOGA AND THE MOCCASIN BEND OF THE TENNESSEE RIVER FROM LOOKOUT MOUNTAIN

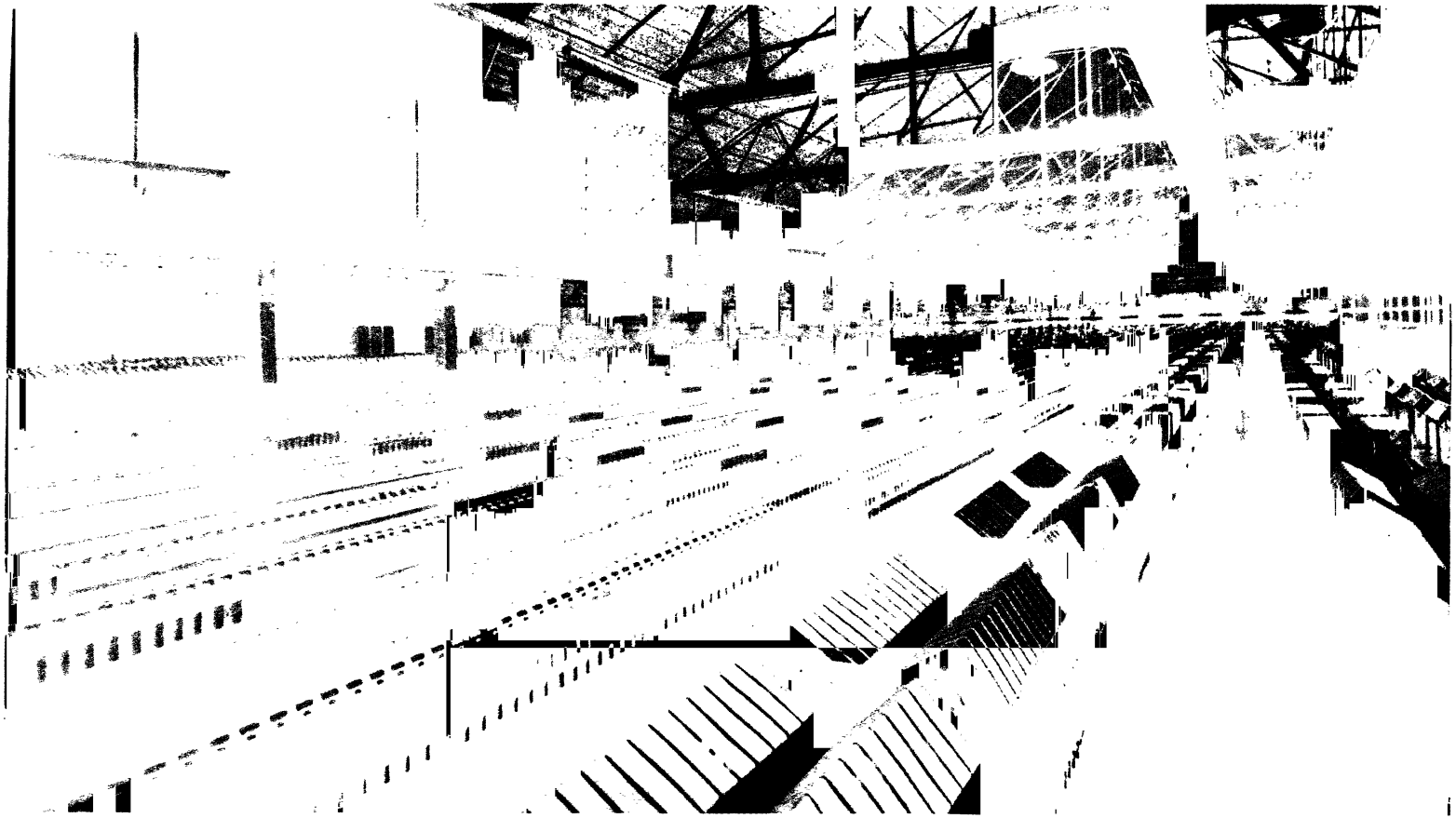
Eastern Tennessee and western North Carolina have some of the most beautiful landscapes in America. History and nature conspire to lend the whole region a deep and abiding interest. The picturesqueness of the Lake Toxaway country of North Carolina and the Civil War history of the Lookout Mountain country have a wide appeal and make friends of all who journey that way.



Photograph by T. P. Robinson

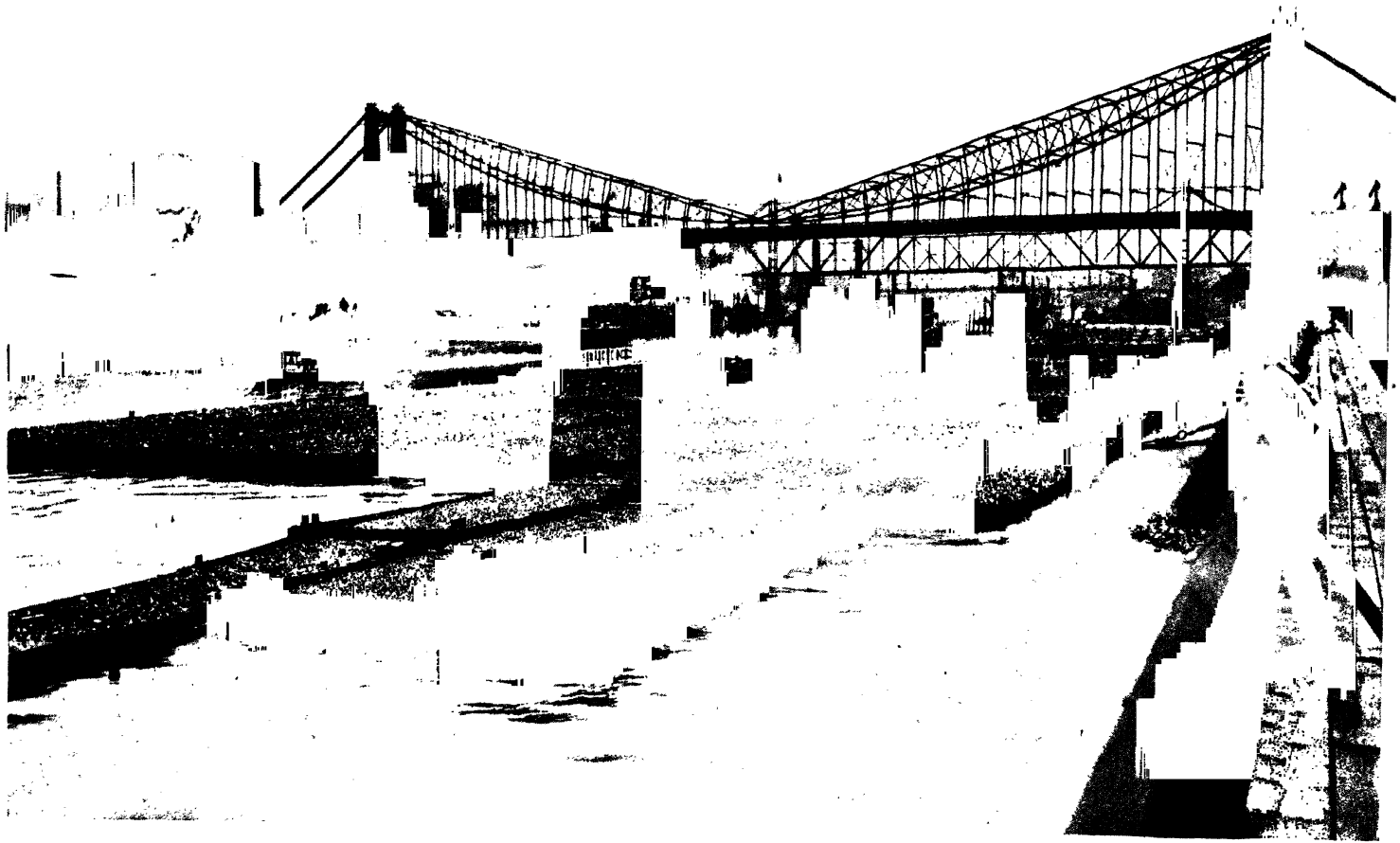
THIS IS NOT A SCENE ON THE BANKS OF THE NILE, BUT A VIEW ON ECONLOCATCHEE CREEK, FLORIDA

Florida, with its cabbage palms, tropical jungles, palatial hotels, and wide, hard beaches—"the land of eternal summer"—is only thirty-five hours distant from New York and thirty-three from Chicago.



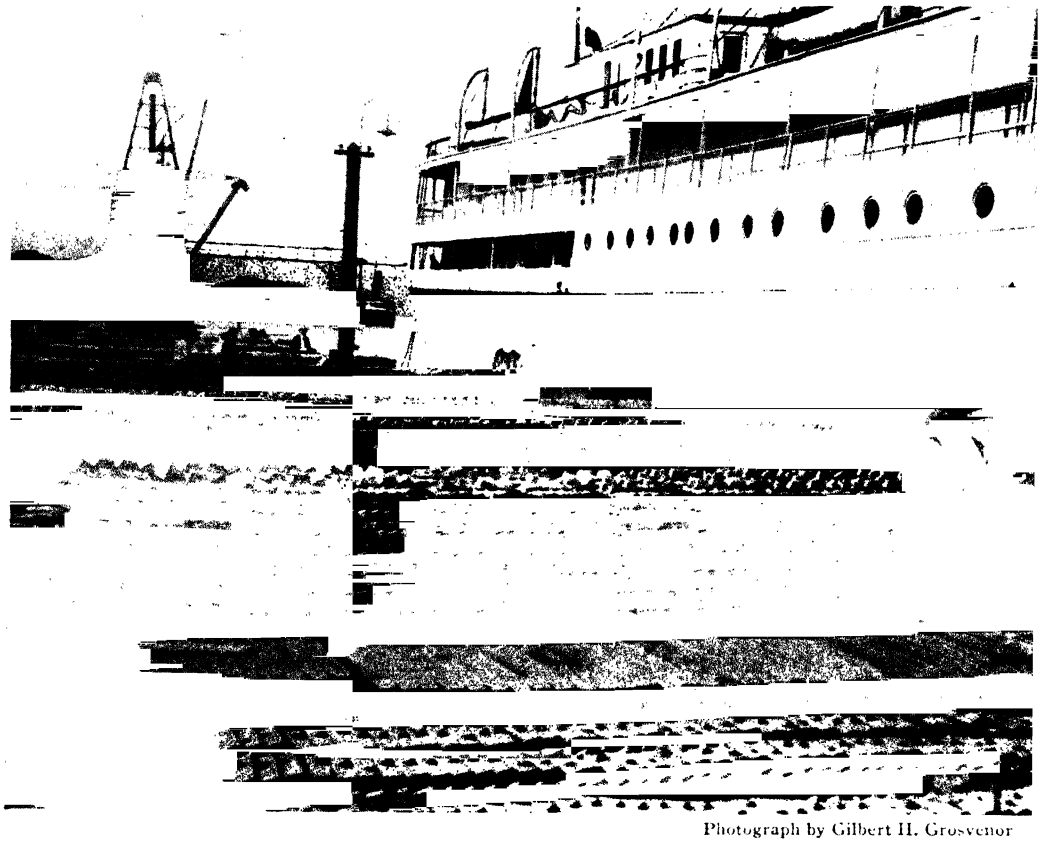
A GREAT AMERICAN SILK MILL AT SCRANTON, PENNSYLVANIA

Although Paterson, New Jersey, is America's leading silk city, to the vicinity of Scranton, Pennsylvania, comes one-third of all the raw silk imported into the United States, and some of the country's biggest silk mills are located here. The illustration above shows the interior of one of these great manufactories and a typical modern American textile mill, where a maximum of cleanliness, pure air, and floods of sunlight make for the best working conditions. This enormous room has a floor area of about 35,000 square feet, and 450 operatives are required to attend to the wants of this acre of machinery.



A VIEW OF THE ALLEGHENY AT PITTSBURGH

No, this is not gravel from the river bottom nor oysters from the bay. It's a Pittsburgh coal fleet in the Allegheny River loaded with "l :k diamonds" to keep alight the fires which help to make Pittsburgh one of the foremost industrial cities of the world—a furnace of Vulcan in al life.



Photograph by Gilbert H. Grosvenor

ONE OF THE COUNTLESS AMAZING SIGHTS TO BE SEEN ON THE WHARVES OF OUR GREAT LAKES: FIVE HUNDRED THOUSAND DOLLARS' WORTH OF COPPER INGOTS AWAITING SHIPMENT AT HOUGHTON, MICHIGAN

Industrially as well as scenically the United States affords fields of interest to the tourist surpassed by no other part of the world. We produce three-fifths of the world's copper, two-fifths of its iron and coal, one-third of its silver, lead, and zinc, and one-fifth of its gold.

land or Pennsylvania, you see a landscape that painters love—undulating hills, rolling fields, watered with winding streams and ornamented by groves of oak and hickory, picturesque farm-houses, and huge barns packed to the rafters with Nature's gifts, for these counties possess some of the best land and best farmers of America.

Fifty-four thousand of as brave men as ever marched to martial music mingled their blood at Gettysburg in 1863. The government of the United States has spared no effort to preserve to the future the memories of those who bore the brunt of the bitter struggle, and to mark alike the position of the Blue and the Gray of those sanguinary days. It is the best marked and best cared-for battlefield in the world. With its magnificent picture of pastoral beauty, its splendid roadways, and its eloquent monuments, Gettysburg is a sight to thrill the heart of every American.

Nowhere can we find sights and memories more precious to our hearts than those which abound in Washington, the most stately capital city in the world. The glories of the nation's capital have, however, been so well described in the pages of this Magazine by ex-President Taft and Viscount Bryce that they need not be referred to here.

Not far from Washington is Harpers Ferry, where the Potomac breaks through the mountains on its way to the sea, and the scene of John Brown's raid; here came Stonewall Jackson to capture the



Photograph by W. H. Brandel

TYPES OF AMERICAN GRAIN ELEVATORS: THE GREAT LAKES

The United States is the principal grain exporting nation in the world, having more grain elevators than the remainder of North and South America and Asia and Africa together

force which stood in the way of the Confederate effort to carry the war into Maryland and the North in 1862.

From Harpers Ferry far away to the south stretches the famous Shenandoah Valley, the granary of the Confederacy in the 60's, of which Sheridan declared that he had laid it so bare that a crow flying across it would have to carry his rations. The Valley Turnpike, once the race-course of armies, is now the peaceful highway of the automobilists who journey from the North to the South.

WALLS OF DIAMONDS AND PEARLS

Half way up the Shenandoah Valley are the Luray Caverns, an underworld palace built by the busy hands of trickling waters. Aladdin, we are told, was once permitted to enter a cave which exhibited such decorations that its glory both dazzled and affrighted. But Aladdin never beheld anything more wondrously exquisite than the water-built architecture of Luray.

The Throne Room is canopied with curtains woven of diamonds and pearls. The Saracen's Tent has more than Oriental splendors of richest damasks and golden samite, which drape the crystal couch in festoons of magic beauty. Titania's Veil is woven of petrified spiders' webs, while the Ball-room seems as if set to celebrate a marriage between the gods.

The visitor to Luray today shares the sentiment of another visitor of long ago, who exclaimed: "Mortal hath not made the like, nor human fancy conceived a thing more magnificent!"

As one journeys westward from the Atlantic seaboard, whether by the northern route and by boat through the Great Lakes, touching at points of interest along their shores, or by one of the central routes through western Pennsylvania or West Virginia, or yet by a southern road through New Orleans, there will be discovered a continual succession of dramatic and matchless spectacles.

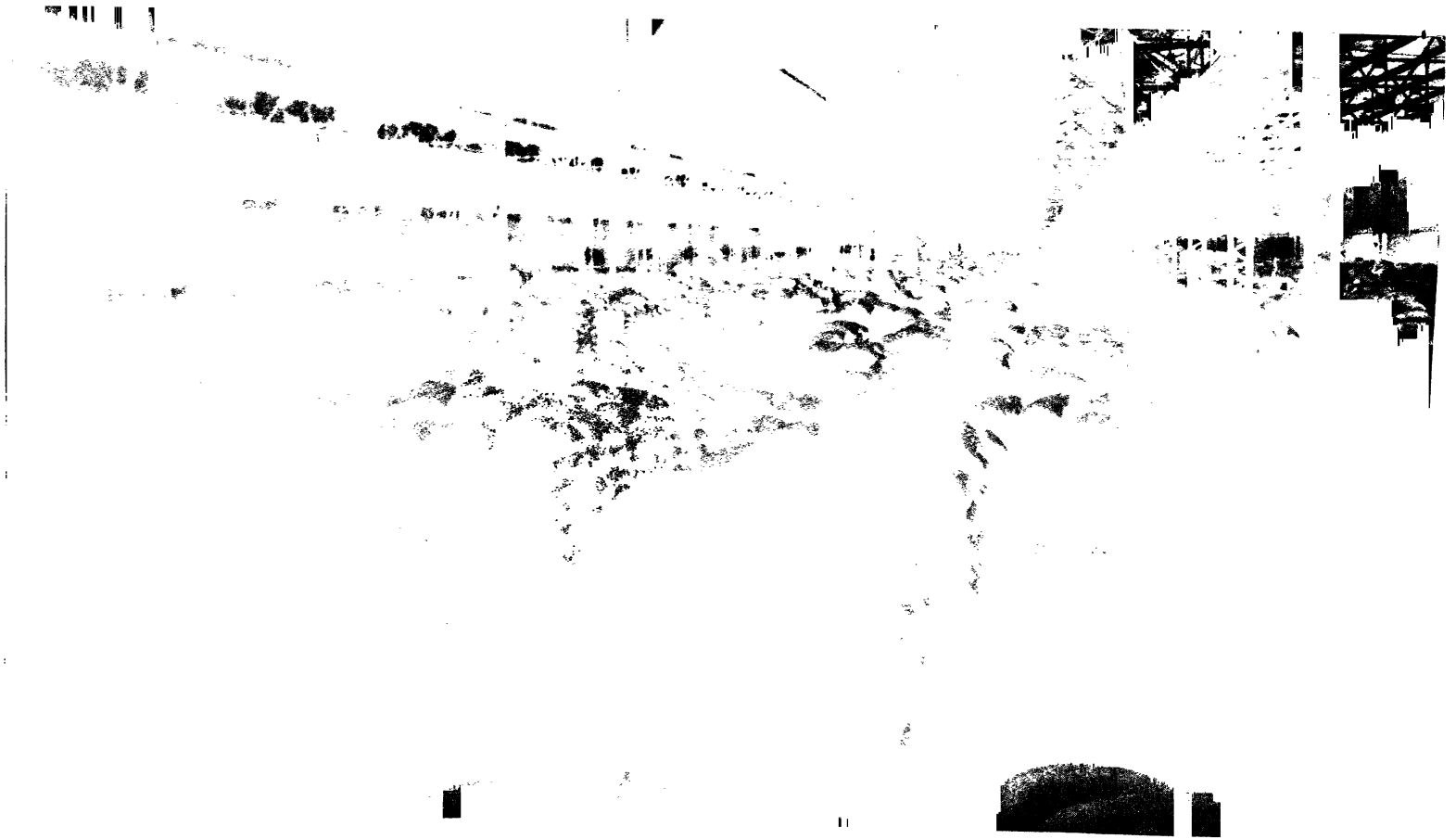
Not the least of these is the Mammoth Cave of Kentucky, the biggest cavern of the world. The discovery of the cave



Photograph by Eugene J. Hall

THE ROAD DOWN THE BLUFF NEAR ALMA, WISCONSIN: MISSISSIPPI RIVER

The country at the head of the "Father of Waters" was once the scene of hard-fought Indian wars and in those days, not so long ago, a wilderness of vast expanse. Now it is thickly settled by farmers, whose fields of golden wheat have brought them wealth, and many of whom now superintend the work on their farms from the rear seat of an automobile.



COFFEE EN ROUTE TO YOUR CUP: PORT OF NEW ORLEANS

Photograph from M. L. Alexander

New Orleans has the largest agricultural warehouse in the world. It has a capacity of 2,000,000 bales of cotton and is adapted to the storage of all other packed commodities, such as sugar and coffee. It was built at a cost of $3,500,000 by the State of Louisiana and is said to reduce the cost of handling any agricultural commodity 40 per cent. There are 23 acres of ground under roof, while the entire plant occupies 150 acres. It is only through such giant structures as these that the United States is able to handle the vast amount of agricultural commodities that pass out of our ports.



Photograph by A. Schlechten

THREE FORKS OF THE MISSOURI RIVER NEAR THE CITY OF THREE FORKS, MONTANA

Far up in the Rocky Mountains of Montana, at the eastern apex of an equilateral triangle between Helena, Butte, and Three Forks, three mountain rivers come together to make the Missouri. They are the Jefferson, the Gallatin, and the Madison, named by Lewis and Clark in honor of President Jefferson and his two ranking advisers. It was here that Sacajawea, the Indian "bird woman," guided the Lewis and Clark expedition from the Dakotas' grasp and climbed to the top of the ridge for a survey of the country. Although carried away in her childhood, she recognized the spot as her long-ago home, and announced that she knew the territory from there to the Pacific. In the picture the river on the right is the Jefferson, that in the center the Madison, and that to the left the Gallatin.



NEARING THE SUMMIT OF PIKES PEAK ON THE COG RAILWAY

Pikes Peak, 14,108 feet, is the highest mountain in America whose summit is reached by a railroad. Little Switzerland, only one third as large as the State of New York, contains more mountain tops accessible by railway than the entire United States. It may be stated, however, without belittling the enterprise and industry with which the Swiss engineers have patiently constructed their marvelous railways to the summits of Gorner Grat, Pilatus, Brienz, Rigi, etc., that the money which financed these railways was in large part the vacation cash left in Switzerland by American tourists.

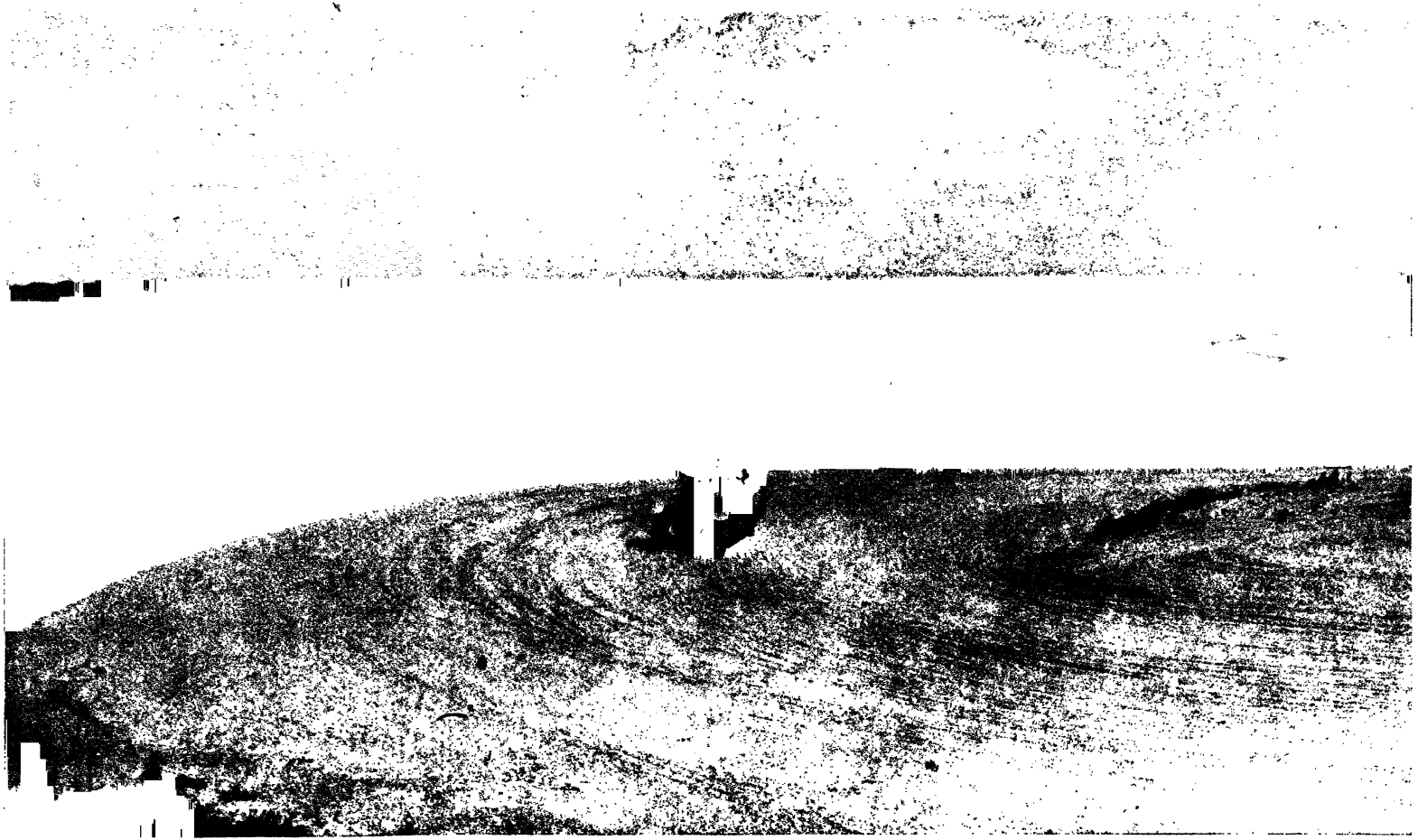
was a God-send to the country, for in the war with England in 1812 the United States secured from it the nitrous earth from which was derived the saltpetre used in the manufacture of the gunpowder for our armies.

Nowhere else can one travel so far in Plutonian regions of perpetual night, where petrified efflorescence is a substitute for vegetation, as in this great cavern. Vastly larger than Luray, the Mammoth Cave possesses a rich variety of formations. Many of these are huge in their proportions and remarkable in the delicacy of their structure.

Strange species of creatures are to be found there. One of these is a blind and wingless grasshopper, with extremely long antennæ; another is a blind and colorless crayfish; and a third, a blind fish which grows to the length of about six inches, and possesses the additional curiosity of being viviparous, producing its young in a living state instead of by eggs. Occasionally there are fish caught in the running streams of the cave which are identical with species common in Green River, indicating a subterranean connection between that river and the streams of the cave.

THE MOST IMPORTANT RIVER IN THE WORLD

The imperial Mississippi Valley may well claim the attention of those who



PIKES PEAK AUTO HIGHWAY, SHOWING A HAIRPIN CURVE FIFTY FEET WIDE

Few States have done as much as Colorado to make their scenery accessible to the tourist. The building of the splendid automobile highway to the top of Pikes Peak exemplifies what a progressive spirit the Centennial State has shown, both in providing visitors with facilities for seeing her places of interest and in welcoming them to her borders.



ON THE ROAD TO THE SUMMIT OF PIKES PEAK

The automobile in the picture is 13,000 feet above sea-level. On the top of the peak there are long-distance telephones, a parking space for three hundred automobiles, and a lake.

would know and appreciate the bigness and the diversity of industry and power of our country.

Our books tell us that 22 of our States and 40 per cent of the total area of our country are comprised within the Mississippi Valley; that nowhere else on the globe is there as large a region of equal fertility; that it grows the bulk of the nation's food and produces nearly two-thirds of our manufactures, and that, politically and commercially, it is more important than any other valley in the world.

But how tame the written statement is compared to the actual sight of oceans of green, growing corn; of waving wheat, oats, rye, and barley extending for hundreds of miles; of the huge plows, reapers, and threshing machines drawn by 16 horses or propelled by engines as big as the locomotive of an express train.

Or, if you are more interested in seeing things fashioned by the brain of man, tarry at Gary, Dayton, Cleveland, Detroit, Chicago, Milwaukee, etc., each the birthplace and home of enterprises peculiarly American and giving employment to tens of thousands. There you will stand in awe at sights a thousand times more astounding and stimulating than many of the feudal castles and tortuous streets of Baedeker's specialties.

The fortunate individual who can follow our majestic Father of Waters from the upper reaches of its principal tributary, the Missouri, down the longest river course in the world to the Gulf of Mexico will have an experience that cannot be duplicated. As he successively watches



Photograph by George L. Beam

THE ROYAL GORGE, GRAND CANYON OF THE ARKANSAS: COLORADO

This gorge is the deepest chasm in the world through which a railroad passes. At one point it is so narrow that the railroad, unable to find a road-bed, passes over an iron bridge 200 feet long, suspended from girders mortised into the granite walls of the gorge, which is here half a mile deep.



Photograph by Hiscock

VIEW IN SHOSHONE CANYON: WYOMING

The automobile road from Cody, Wyoming, to the Yellowstone Park, which the United States Government has constructed, passes through the Shoshone Canyon. Five tunnels had to be blasted for its passage. Here the Government has built the second highest dam in the world. The lake it forms has a shoreline 42 miles long and furnishes water for the irrigation of more than 40,000 acres of land.



Photograph by F. J. Haynes

LONE STAR GEYSER: YELLOWSTONE NATIONAL PARK

There are more geysers in Yellowstone National Park than in all of the remainder of the world. Stupendous as are the spectacles of these giant natural fountains in eruption, they are but feeble reminders of the titanic times whose records are written all over the face of the park.



Photograph by F. J. Haynes

THE GIANT GEYSER OF THE YELLOWSTONE NATIONAL PARK

The Giant Geyser, with its tremendous outpouring of water and steam shooting 200 feet into the air and lasting for a full hour, is one of dozens of geysers found in the Yellowstone. They have all been named, and expressively so: the Black Growler, always fretting and fuming, but never doing much else; the Constant, on the job every half minute, with a ten-second eruption; the Minute Man, with a one-minute eruption and an irregular, short interval; the Beehive, shooting up out of a hivelike sinter cone; the Castle, with its fairy house; the Comet, the Daisy, the Economic, the Fan, and the Lion, each filling well the plans and specifications of its name; and Old Faithful, the originator of the "every hour on the hour" schedule.



Photograph by Edward S. Curtis

A HERD OF BISON IN THE YELLOWSTONE NATIONAL PARK

Yellowstone National Park is destined to be the principal game preserve in America. It contains an increasing herd of wild bison, fifteen thousand elk, several thousand moose, and innumerable deer. It is not an exceptional sight to see a park attendant feeding lump sugar to little bear cubs, while the mother bear plays the rôle of interested spectator in the offing. More than one hundred and fifty species of wild birds lead an undisturbed existence in the park.



Photograph by W. S. Berry

YELLOWSTONE FALLS: YELLOWSTONE NATIONAL PARK

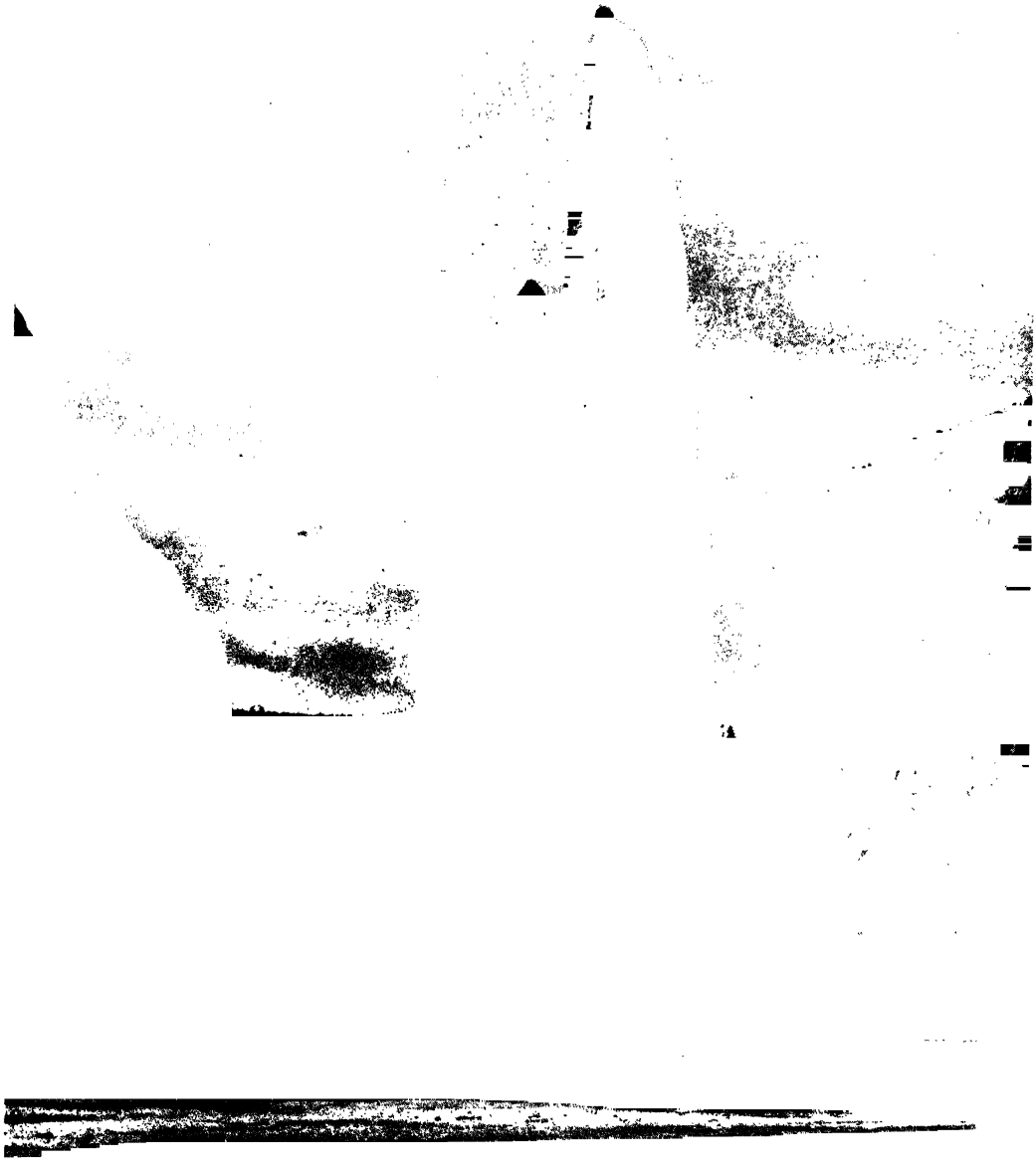
Yellowstone Canyon has been called the cameo of canyons. Burton Holmes has described it as "a mine of precious stones, uncovered to amaze and dazzle the sun itself." Adown its rocky bottom flows the Yellowstone River, and, where it is grandest and most beautiful, the river takes a leap twice as high as Niagara, making a marvelous veil of seething, frenzy-lashed, white water—a spectacle which, with its setting and majestic roar, is one of awe-inspiring majesty.



Photograph by F. J. Haynes

EAGLE-NEST ROCK: YELLOWSTONE NATIONAL PARK

It seems as if Nature decided to establish in the region which we call the Yellowstone National Park a museum where, without traveling far, mankind could study all of her processes and see exhibits portraying all of the activities of the millions of years of earth-making.



Photograph by Roland W. Reed

THE OBELISK: CAÑON DE CHELLY, ARIZONA

The tiny men on horseback at the foot of this towering shaft of stone tell a striking story of its size. It is but one of a thousand of these stately spires and nature-built obelisks that rise out of the earth in this region of scenic surprises.



THE RAINBOW NATURAL BRIDGE, UTAH

Photograph by Kolb Bros.

The biggest natural bridges in the world are to be found in the United States. The largest of these, the Rainbow, 308 feet high, would span the dome of the United States Capitol, with room to spare, and is nearly as high as the Flatiron Building in New York. Its span is six times as great as that of the Natural Bridge of Virginia. Utah alone has three natural bridges that are higher and of greater span than any other natural bridge in the world.



Photograph by N. H. Darton

A VIEW OF ONE OF THE SIDE WALLS OF THE GRAND CANYON OF THE COLORADO

"Looking down more than half a mile into this 15 by 218 mile paint-pot, I continually ask, Is there any other fifty miles of Mother Earth that I have known as fearful, as full of glory, as full of God?"—JOAQUIN MILLER. "A pageant of ghastly desolation and yet of frightful vitality, such as neither Dante nor Milton in their most sublime conceptions ever approached."—WILLIAM WINTER. Search the entire globe and you will find nothing outside the United States comparable to the Grand Canyon

250 other rivers, many of them turbulent giants like the Ohio, the Arkansas, the Red, etc., add their brown floods to the broad torrent, he can easily comprehend the statement that the Mississippi River discharges into the sea one-half more water than do the Rhine, Loire, Po, Elbe, Vistula, Danube, Don, Dnieper, and Volga all together, and that it brings down to the Gulf of Mexico annually more material than has been taken out of the Panama Canal from the day that De Lesseps removed the first shovelful of earth.

On the lower reaches of the Mississippi he sees dikes thicker, higher, and longer than any Holland can show, parts of a levee system much more extensive than the famous reclamation works on the Zuyder Zee. The latter, however, are better known, being generations older and nearer to routes frequented by travelers and writers.

Here, also, he passes sugar-cane plantations, cotton fields, cypress forests, quaint old steamboats redolent with memories of the days of Huck Finn, picturesque negro populations—a weird contrast to the blazing furnaces of Pittsburgh, the white flour mills of Minneapolis and St. Paul, the noisy cattle yards of Kansas City and Omaha, the snow-capped mountains of Montana and Wyoming and Pikes Peak in Colorado, all tributary to the same river.

It is to be regretted that today there is very little traffic on the river compared to earlier days.

THE YELLOWSTONE PARK

Leaving the masterful Mississippi Valley and journeying westward, we soon enter the region of the national parks, of which there are eight of the first order—the Yellowstone National Park, principally in Wyoming; the Glacier National Park, in Montana; the Rocky Mountain and Mesa Verde National Parks, in Colorado; the Crater Lake National Park, in Oregon; the Mount Rainier National Park, in Washington, and the Yosemite and Sequoia National Parks, in California. To these must be added the Grand Canyon of the Colorado, in Arizona, the scenic masterpiece of the world, officially classed as a national monument until Congress makes it a park. Each park has its own individuality, and each in its specialty excels. Together they contain more features of conspicuous grandeur than are accessible in all the continents.

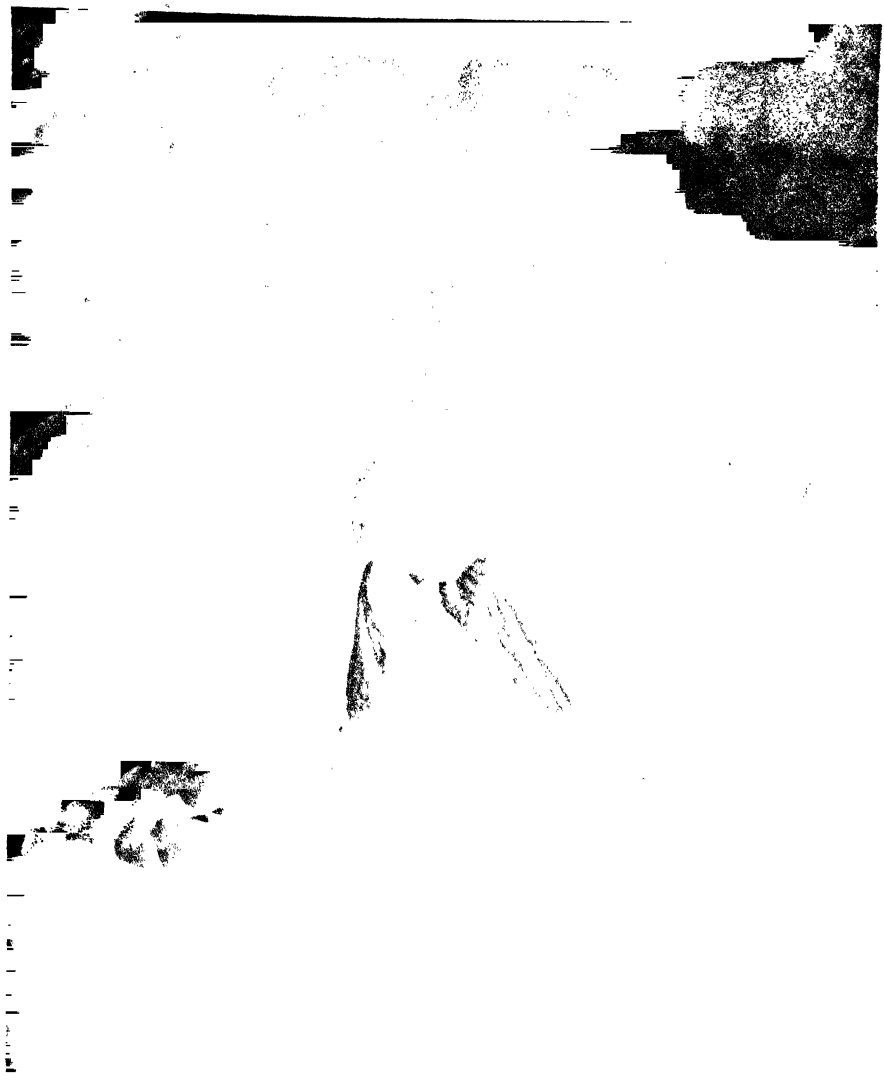
Foremost in interest in the Yellowstone are the geysers, of which "Old Faithful" ranks first, not because of size, for the Giant is a Goliath beside it; not because of beauty, for there are others more beautiful; but because of fidelity. It never disappoints. It is so regular that it could almost serve as the nation's standard timepiece. Every 70 minutes "Old Faithful" shoots its great column of water heavenward. At each eruption it sends up into the air a million and a half gallons of water (see pp. 370-371).

One writer has described the geyser basins "as laboratories and kitchens, in which, amid a thousand retorts and pots, we may see Nature at work as chemist or cook, cunningly compounding an infinite variety of mineral messes; cooking whole mountains; boiling and steaming flinty rocks to smooth paste and mush—yellow, brown, red, pink, lavender, gray, and creamy white—making the most beautiful mud in the world, and distilling the most ethereal essences.

"Many of these pots and caldrons have been boiling thousands of years. Pots of sulphurous mush, stringy and lumpy, and pots of broth as black as ink are tossed and stirred with constant care; and thin transparent essences, too pure and fine to be called water, are kept simmering gently in beautiful sinter cups and bowls that grow ever more beautiful the longer they are used.

"In some of the spring basins the waters, though still warm, are perfectly calm and shine blandly amid a sod of overleaning grass and flowers, as if they were thoroughly cooked at last and set aside to settle and cool. Others are wildly boiling over, as if running to waste, thousands of tons of the precious liquids being thrown into the air to fall in scalding floods on the clean coral floor of the establishment, keeping onlookers at a distance.

"Every flask, retort, hot spring, and geyser has something special in it, no two



Autochrome by Franklin Price Knott

A PUEBLO WOMAN AT LAGUNA, NEW MEXICO

She is shovelling bread into an open-air oven, preparing for a corn dance celebration to take place the following day. The Navajo and Pueblo Indians for a hundred miles around Laguna were met on the way to take part in the dance, which is in reality a prayer for rain.



Autochrome by Franklin Price Knott

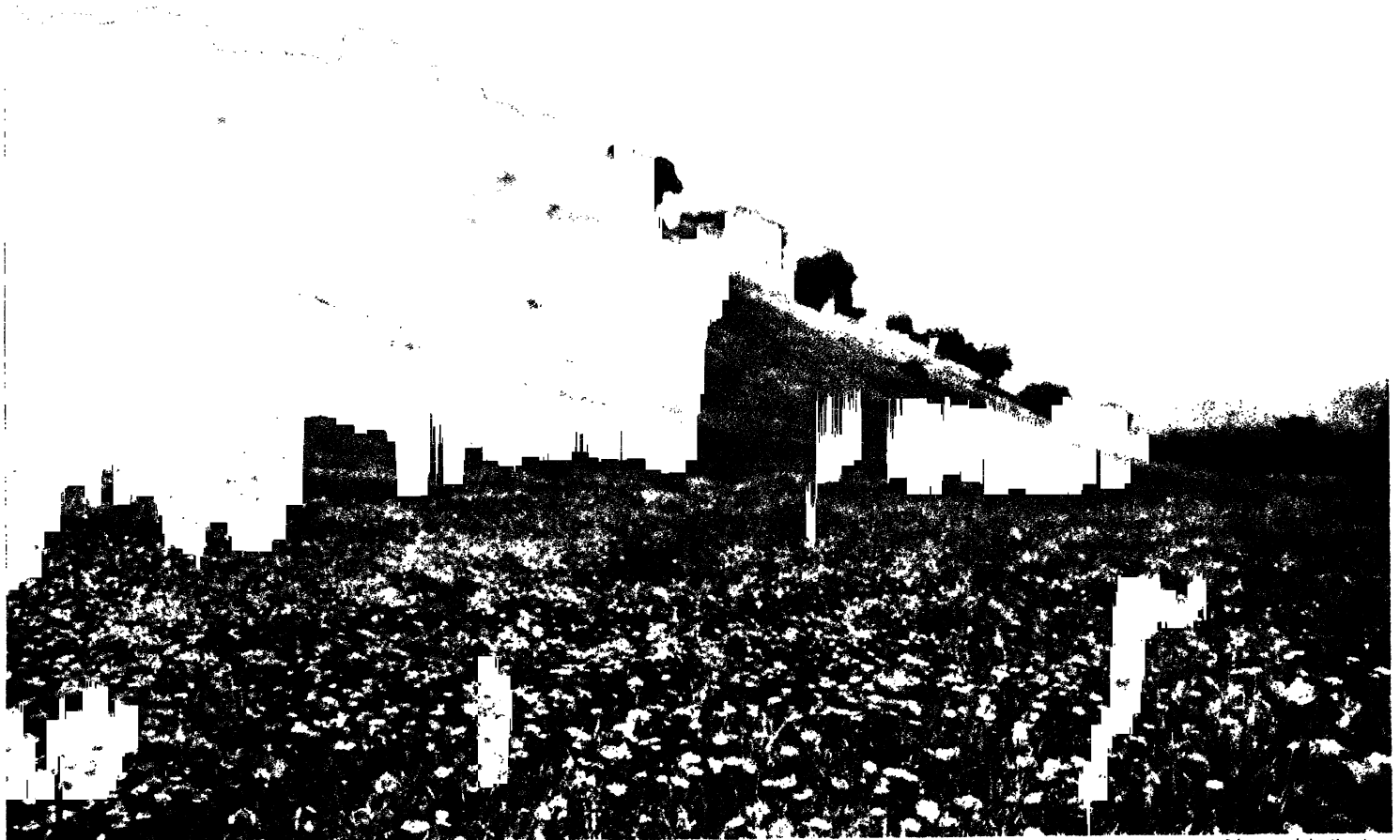
THE SLEEPING TIGER IN THE ZOOLOGICAL GARDENS OF NEW YORK CITY



Autochrome by Franklin Price Knott

"LA MOUSE," A VENERABLE FLATHEAD CHIEF, OVER EIGHTY YEARS OF AGE: GLACIER NATIONAL PARK

His name may suggest the most timid of animals, but his courage is that of the king of beasts. The Northern Indians are very fond of ermine, and cut the skin in strips and hang them on every available part of their costume.



Photograph by Garrison

A FIELD OF POPPIES

No other region in the world possesses greater richness of color or such a vast number of species of wild flowers as the United States. All of the art of Persia has never produced such magnificent carpets as one may see spread over ten thousand landscapes within our boundaries.



Autochrome by Franklin Price Knott

THE HOPI BASKET-MAKER

The untutored art of the American Indian, with its lively appreciation of color values and combinations, and of geometric designs, has been praised by the art critics of every land.



Autochrome by Franklin Price Knott

A WATER CARRIER OF ACOMA, NEW MEXICO

Acoma is said to be the oldest continuously inhabited village in the United States. Its people defied the Spaniards before Jamestown or Plymouth Rock appeared in history.



Autochrome by Franklin Price Knott

HOPI INDIAN AND HIS HOME

The brilliant red of his blanket proclaims the success of the Southwestern Indian in producing fast colors. Some tribes are able to make multi-hued blankets with the delicate shadings of the finest art embroidery, the weaving being so perfectly done that one cannot tell which is the right and which the wrong side.



Autochrome by Franklin Price Knott

A TWENTIETH CENTURY PHIDIPPIDES OF THE HOPI TRIBE

Not even the messenger to Sparta showed greater endurance than the pure-blooded son of the American desert. Many of the Hopi Indians ran daily to and from their little farms, often ten or twelve miles away from the barren mesa where they live.



Autochrome by Franklin Price Knott

A CENTURIES-OLD STAIRWAY, ACOMA, NEW MEXICO

The same races that built the splendid structures of Yucatan and Chiapas constructed the pueblos of Arizona and New Mexico, and that they did their work well is shown by the way it has defied the teeth of time.



Autochrome by Franklin Price Knott

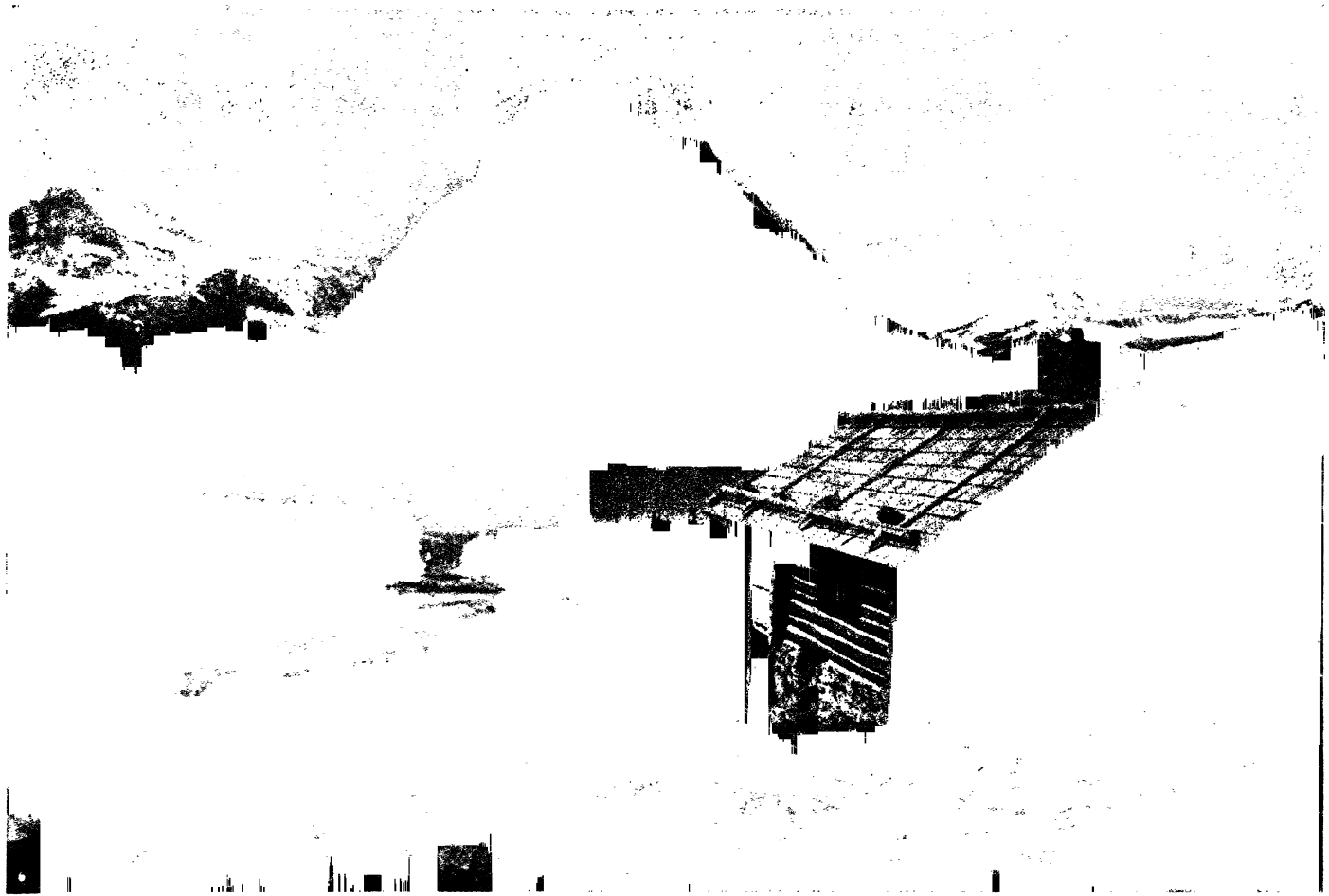
SUN BOW, PUEBLO CHIEF, OF TAOS, NEW MEXICO

This noble specimen of his race, though wearing a war bonnet, is a man of peaceful pursuits. He and his people are not wards of the Government, for they hold their lands under early Spanish grants, and have always managed their own tribal affairs and property.



Autochrome by Franklin Price Knott

THE SOUTH PUEBLO OF THE TAOS INDIANS: NEW MEXICO
This is a big community house, the home of about three hundred industrious people.



Photograph by Kiser

LAKE McDERMOTT AS SEEN FROM MANY-GLACIER CAMP: THE GLACIER NATIONAL PARK

Hundreds of gigantic peaks of the Rocky Mountains crowd one upon the other through the length and breadth of Glacier Park. The richly colored s afford an excellent background for flocks of snow-white mountain goat and mountain sheep, which have been so carefully protected in this park t these beautiful creatures, so rare elsewhere in America, are here quite common.



Autochrome by Franklin Price Knott

MEDICINE MEN COMPOUNDING THEIR POTIONS, GLACIER NATIONAL PARK

"Big Springs" and "Black Bull," the medicine men of the Blackfeet Indians, are among the best examples of their race. "Black Bull" wears his hair unbound as the badge of mourning for the death of a child.



Autochrome by Franklin Price Knott

THE BIRTHPLACE OF THE RAINBOW

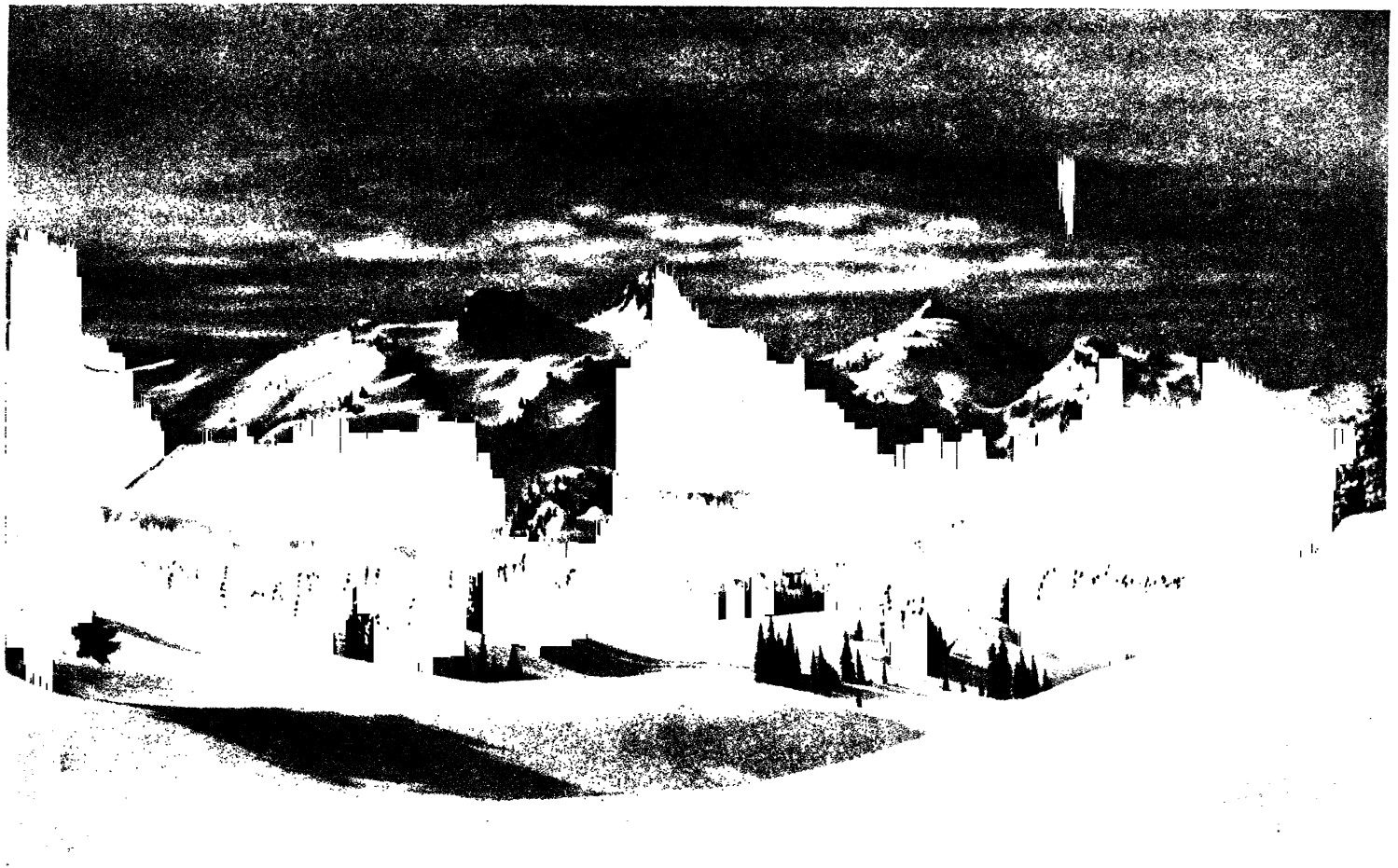
Man cannot unscramble eggs, but a single drop of water can unscramble light, and the effect of this process at the Bridal Veil Falls of the Yosemite is both sublime and beautiful. The Yosemite contains four other falls as magnificent as the subject of this picture, the Vernal Fall (drop 317 feet), the Nevada Fall (drop 594 feet), the Illilouette Fall (drop 370 feet), and the Yosemite Falls (upper fall, drop of 1430 feet; lower fall, drop of 320 feet). The Bridal Veil Falls has a drop of 620 feet. Each one of these five remarkable waterfalls surpasses in grandeur and the magic play of light and water, any waterfall of Switzerland or on the continent of Europe.



Autochrome by Franklin Price Knott

CONSIDERING THE LILIES: MT. SHASTA IN THE DISTANCE

Mount Shasta, according to an Indian legend, was the first mountain made by the Creator as His masterpiece, and with this as a model He designed the other mountains of the world. The ascent of Shasta is difficult, but with competent guides is not perilous. With the little town of Sisson as a base, there is a good horseback trail to Timberline Camp, an overnight rest six miles away. Starting from this camp very early the next morning, the experienced mountaineer can make the ascent and return to Sisson in a day.



Photograph by A. H. Barnes

A WINTER SUNRISE, RAINIER NATIONAL PARK

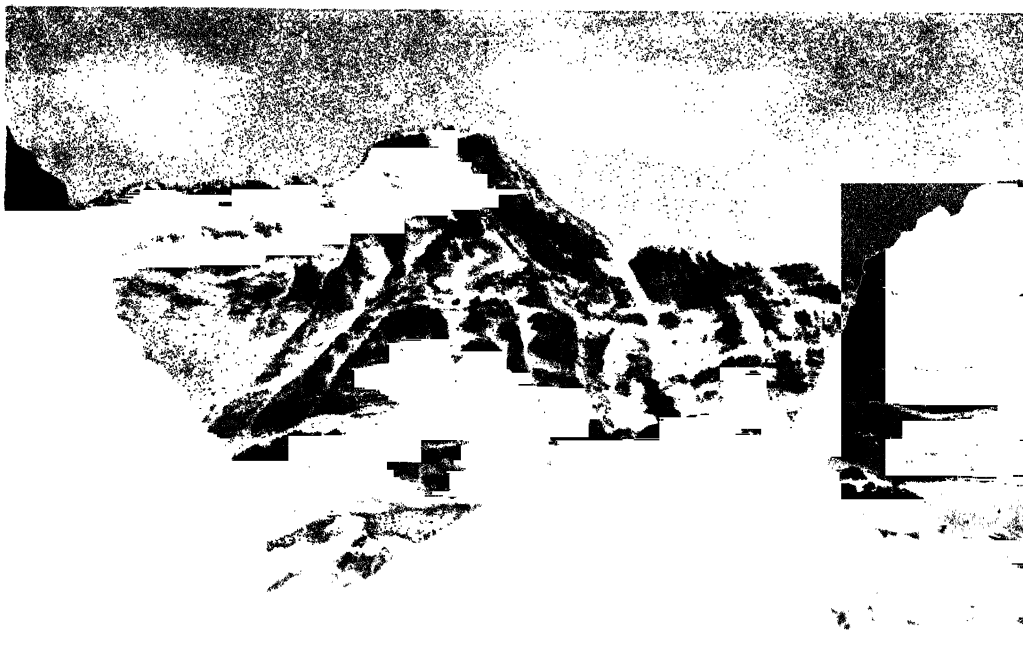
This view shows the southern slope of Tatoosh Range, the height of which may be judged from the statement that the foreground itself is more than a mile higher than the Pacific at high tide.



Photograph by A. H. Barnes

ALPINE FLOWERS IN RAINIER NATIONAL PARK

The flowers of our mountains match the sunset skies for color, the sands of the sea for numbers, and the filmy-winged butterfly for grace.



Photograph by Kiser

A SAPPHIRE IN A MOUNTAIN SETTING: BLUE LAKE IN THE GLACIER NATIONAL PARK

What American engineers have done at Gatun, glaciers have done in our high mountains. A glacier lake is often a dam-obstructed river, the dam being built out of the earth-shavings resulting from the flowing onward sweep of the mountains of ice.

being the same in temperature, color, or composition."

The Yellowstone National Park has a canyon gorgeous with all the colors and shades of the rainbow, and is the best stocked wild-animal preserve in the world (page 372).

THE GLACIER NATIONAL PARK

The situation of Glacier National Park is unique, in that it mothers streams which flow into three out of five of the earth's great oceans. It may well claim to be the top of the continent, for its rivers drain into Hudson Bay and the Arctic Ocean, into the Pacific, and through the Missouri and the Mississippi into the Atlantic.

As the Blackfeet Indian Reservation adjoins the park, the visitor has the added touch of charm that Indian life gives to any wild place (see pages 386-393 and 403).

The Glacier National Park was made by the earth cracking in some far-distant time and one side thrusting up and overlapping the other. It has cliffs several thousand feet high, and more than sixty glaciers feed hundreds of lakes. One lake floats icebergs all summer. The scenery is truly Alpine (see pages 402 and 410).

Lake St. Marys, Lake McDermott (page 402), and Lake McDonald are the peers of any of the mountain lakes of Switzerland and Italy. This park covers an area of 1,534 square miles, and maintains such an excellent chain of chalets, hotels, and trails that the tourist can see its many attractions in comfort.

THE PARKS IN COLORADO

The Rocky Mountain National Park straddles the Continental Divide at a lofty height, with snow-capped mountains extending from end to end. This park is in the heart of the Rockies northwest of Denver, with Longs Peak as its center. It was established by congressional enactment last year. Estes Park, the gateway to this mountain playground, is a beautiful little valley town nestled at the foot of the ridge, and yet itself more than a mile and a half above sea-level. Longs Peak is nearly three miles high, and has several neighbors that run it a close second.

The Mesa Verde National Park hides in its barren canyons the well-preserved ruins of a civilization which passed out of existence so many centuries ago that not even tradition recalls its people.

Here one may study the modes of life of the prehistoric American as they can be studied in few places. These aborigines had their civic center and they had some progressive ideas in city planning. Community life was the order of those times. One house had 200 rooms for family use and 22 for worship. Another once sheltered 350 aborigines. The Sun Palace, discovered by Dr. Fewkes in 1915, is an ambitious structure, apparently dedicated entirely to the worship of the sun.

MT. RAINIER NATIONAL PARK

Mt. Rainier seems to keep perpetual guard over Seattle, Tacoma, and Olympia. Any one who has beheld its many moods, who has watched the ever-changing picture as varying lights have played upon its summit, who has coasted on its glacial rivers, can understand why the Indians called it "Tahoma—the mountain that was God."

The Far Northwest was once a region of terrific volcanic activity. Mt. Shasta, Mt. Hood, Mt. St. Helens, Mt. Adams, Mt. Rainier, and Mt. Baker all stand in one far-flung group as silent witnesses of the dim ages when America was in the making and when they sent their beacon lights across the sea.

Where once flamed the fervent fires of earth's boiling caldrons, today snow and ice reign supreme; where once floods of molten lava swept, today forests of fir, pine, and cedar and gorgeously carpeted flower beds refresh the tourist.

Mt. Rainier has a glacier system exceeding in size that of any other single mountain within continental United States. From its summit and cirques twenty-eight named and a number of unnamed rivers of ice pour slowly down its sides. These rivers of ice have carved on what was once a perfect cone fourteen valleys through the solid rock. A bird's-eye view taken from above the mountain would show it to be covered by



THE GIANT FOREST IN THE SEQUOIA NATIONAL PARK: CALIFORNIA

The extraordinary redwoods of California grow on the western slopes of the Sierra Nevada. Many splendid specimens are to be seen in the Yosemite National Park, but they are found in the greatest numbers in the Sequoia National Park, reached via Visalia, California



Photograph by Curtis & Miller

WESTERN LOGS USED AS DREDGE TIMBERS AT PANAMA

So superior are the trees of the West for masts that they are in demand in almost every shipyard in the world. In the words of Muir: "They are felled and peeled, dragged to tidewater, raised again as masts and yards of ships, given iron roots and canvas foliage, decorated with flags, and sent to sea, where in glad motion they go cheerily over the ocean prairie, in every latitude and longitude, singing and bowing responsive to the same winds that waved them when they were in the woods. After standing in one place for centuries they thus go round the world like tourists, meeting many a friend from the old home forest; some traveling like themselves, some standing head downward in muddy harbors, holding up the platforms of wharves, and others doing all kinds of hard timber work, showy or hidden."

an enormous frozen octopus, stretching icy tentacles down among the rich gardens of wild flowers and through forests of fir and cedar (pp. 406, 408, 409, 427).

THE YOSEMITE AND SEQUOIA NATIONAL PARKS

No words can adequately describe the majesty and friendliness of the giant redwood trees of the Sequoia and Yosemite National Parks, the stately granite domes and sharp pinnacles, the roaring white cascades, the deep, dark canyons; the fragrance of meadows carpeted with lupine, columbine, evening primrose, mariposa lily, shooting-star, pride of the mountain, etc., and the many sweet-scented pines and cedars, among which are flitting countless songsters dressed in as lovely colors as the flowers.

In this fairyland, the lover of outdoor life can camp for months in summer without taking tent or raincoat, for it never rains here in vacation time.

Switzerland, the playground of Europe, visited annually (until 1915) by more than 100,000 Americans, cannot compare in attractiveness with the High Sierra of central California. Nothing in the Alps can rival the famous Yosemite Valley (pages 401, 416, 417), which is as unique as the Grand Canyon. The view from the summit of Mt. Whitney surpasses that from any of the peaks of Switzerland. There are no canyons in Switzerland equal to those of the Kern



Photograph by Gilbert H. Grosvenor

GENERAL SHERMAN, THE KING OF ALL TREEDOM: SEQUOIA NATIONAL PARK

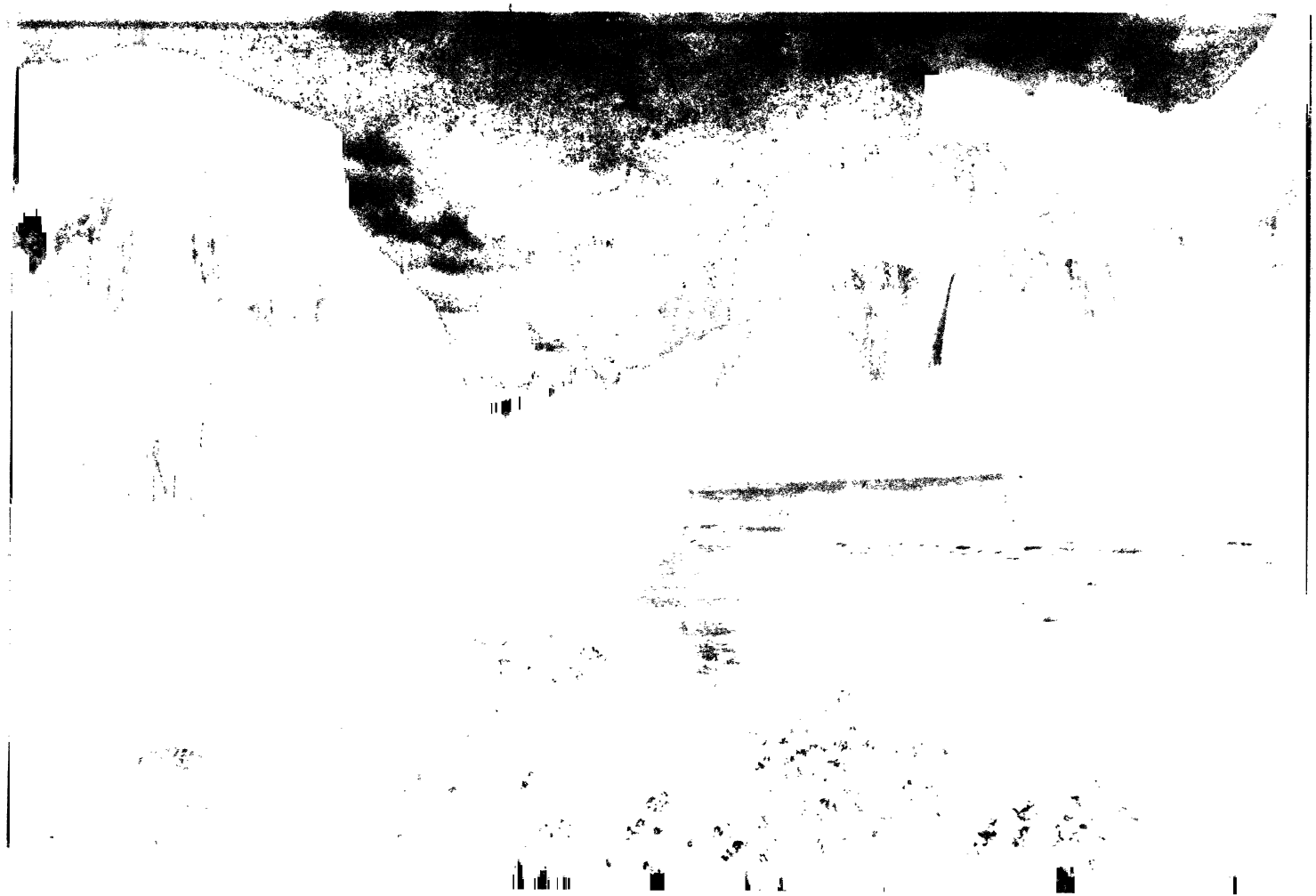
It takes twenty men with arms outstretched to encircle the tree. The General Sherman tree is pronounced by the United States Government the biggest tree in the world, measured by the amount of wood it contains (see also the remarkable photograph by Eddy printed as the frontispiece to this number).



Photograph by Lindley Eddy

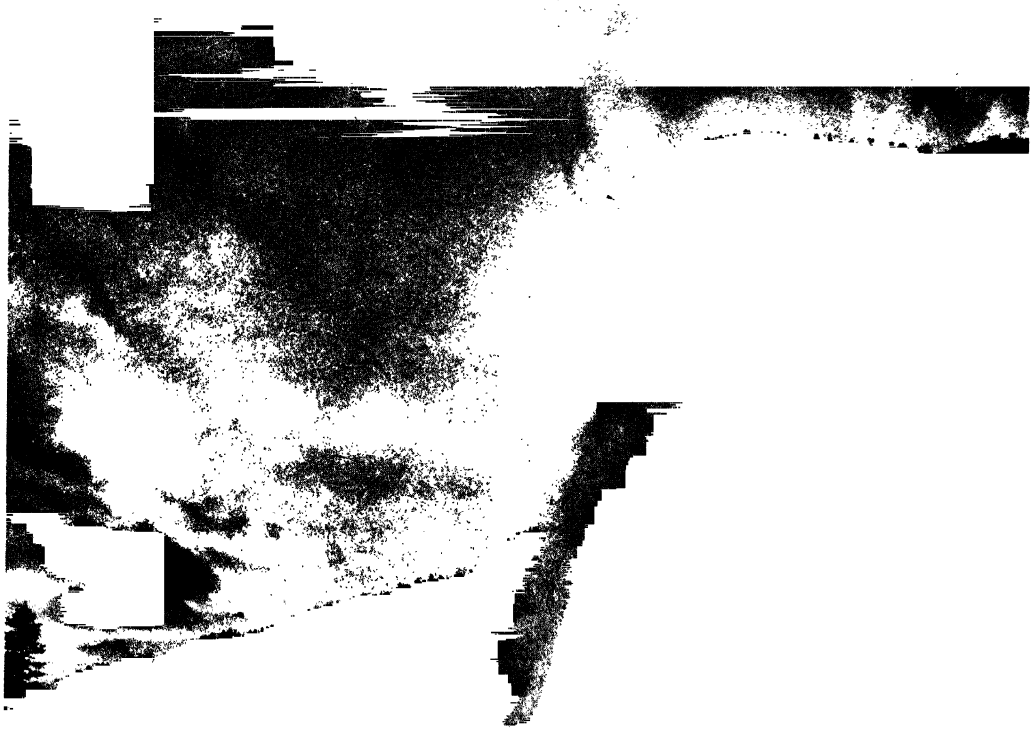
IN THE GIANT FOREST OF THE SEQUOIA NATIONAL PARK, CALIFORNIA

The "General Sherman" Tree, shown on the preceding page and in the frontispiece, belongs to the greatest grove of trees anywhere in the world—the Giant Forest of the Sequoia National Park. The General Sherman fortunately stands on public land, but the majority of the redwoods of the Giant Forest are privately owned. Though it was to preserve this incomparable group of trees that the Sequoia National Park was created by Congress in 1890, funds have been lacking to buy about 1,000 acres scattered through the grove, in 40-acre tracts, on which stand most of the best trees. The owners have expressed a willingness to dispose of their lands to the government and have given options on their holdings, but Congress has never appropriated the money for their purchase. If Congress does not soon appropriate the $50,000 required, it is to be hoped that sufficient funds may be raised by private subscription to buy the private holdings in the park and donate them to the National Government. While these splendid trees are in private hands, there is always the possibility of their destruction.



Photograph by Pillsbury

THE GATEWAY TO THE YOSEMITE, WITH EL CAPITAN ON THE LEFT AND THE CATHEDRAL ROCKS AND POHONO FALLS ON THE RIGHT



Photograph by Gabriel Moulin

EL CAPITAN: YOSEMITE NATIONAL PARK

Towering 3,600 feet above the Merced River, which mirrors back its beauty and its majestic lines, El Capitan, that vast block of unjointed granite, each of whose several faces shows a surface of more than 160 acres, stands in stately silence, one of the noblest rocks on earth—a literal rock of ages.



Photograph from Dewitt Hutchings

MAGNOLIA AVENUE: RIVERSIDE, CALIFORNIA

Riverside is known as the "orange capital," for from it are shipped more oranges than from any other distributing center in the world—5,000 carloads of oranges each year. Here were planted, nearly fifty years ago, the two navel orange trees, imported from Brazil, from which are descended all the seedless oranges of California.

and the King rivers, which contain scores of waterfalls and roaring streams, any one of which in Europe would draw many thousands of visitors annually. Many of the big yellow and red pines, of the juniper and cedar, eclipse the trees of Switzerland as completely as these pines are eclipsed by the giant redwoods.

And then, as to birds and flowers, the High Sierra so excel the Alps that there is no comparison. Never will the writer forget the melodies of the birds and the luxuriance of the meadows passed in the marches from Redwood Meadow to Mineral King, and then up over Franklin Pass; the fields of blue, red, yellow, orange, white, and purple flowers, all graceful and fragrant, or the divine dignity of the great Siberian Plateau, nearly 11,000 feet above the sea, and yet carpeted from end to end with blue lupine and tiny flowers.

From the educational point of view, the High Sierra so surpass the Alps that again no comparison can be made. In one day's ascent we observed fauna and flora to see the equivalent of which on the Atlantic coast we would have to make a journey of perhaps 1,500 miles. When we started in the morning we were hearing birds that correspond to the latitude of Charleston, S. C.; in a few hours we had traveled northward to Newfoundland and Labrador, and then descended to camp amid feathered friends whose counterparts are found around the writer's farm near Washington, D. C. A day later we ascended Mt. Whitney, the highest peak in the United States, and had a glimpse of birds of the Arctic Zone.

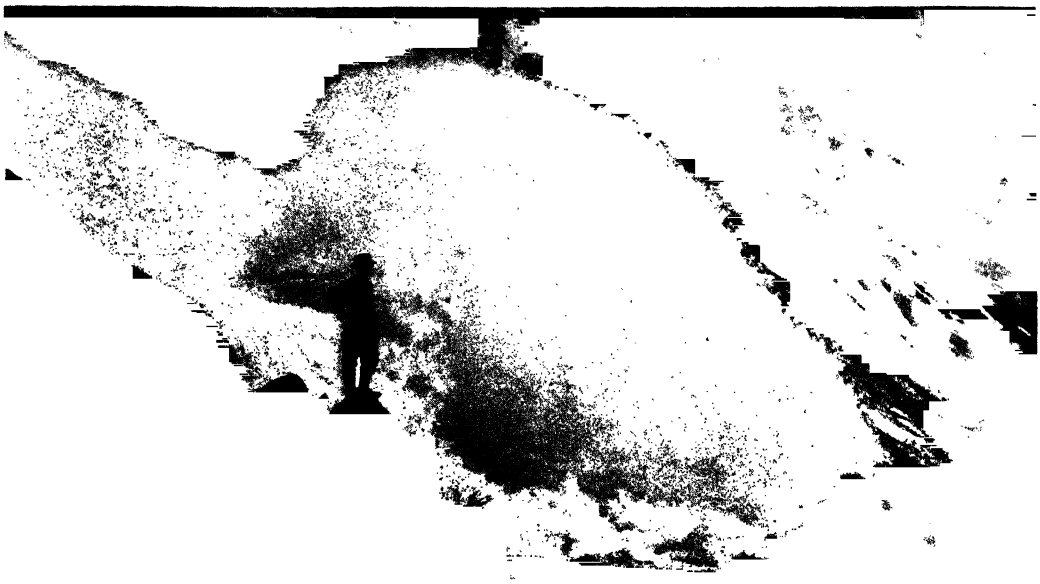


A VIEW OF LAKE TAHOE

Snow-capped mountains and lakes of every shade of blue are scattered throughout our great Northwest in wild profusion. Seeing one after another does not dull one's appreciation of them, however; it only exhausts one's vocabulary. We cross the ocean to see the much-advertised lakes of Scotland and Ireland, which, though picturesque, are eclipsed by scores of lakes in our own land from the Atlantic to the Pacific.

Within the boundaries of the Yosemite and Sequoia National Parks tower the oldest of living things—the *Sequoia gigantea* (see the supplement and pages 412, 414, and 415).

It is an unusual experience to stand under these big trees, to gaze upon their stately proportions, to reflect upon the storms and stress they have survived, and to visualize the strange changes in human history that have taken place since they were seedlings. Long before Moses had led the Children of Israel out of Egypt, long before his brethren had carried back to their father Joseph's blood-stained coat of many colors, long even before the birth of the patriarch whose children and whose children's children to the remotest generations the Most High promised to bless, even before the aged



Photograph by Pillsbury Picture Company

THE LOWER WATER-WHEEL FALL: TUOLUMNE RIVER CANYON, CALIFORNIA

The water, sweeping madly down the Tuolumne River, now and again strikes a spoon-like depression in the hard, sloping granite, which gives it an upward and circular whirl. At high water these astounding perpendicular whirlpools are fifty feet or more in diameter.

Pyramids had reared their heads on the banks of the Nile, long centuries before the Hanging Gardens of Babylon had been constructed, these trees had begun to grow.

Thousands of years the General Sherman tree has stood, offering its head to every passing thunder cloud; but so strong and sturdy is it that, like Ajax, it can defy the lightnings. John Muir gives us a graphic picture of a sequoia in a storm: "When the storm roars loudest, they never lose their godlike composure, never toss their arms or bow or wave like the pines, but only slowly, solemnly nod and sway, standing erect, making no sign of strife, none of unrest, neither in alliance nor at war with the winds, too calmly, unconsciously capable and strong to strive with or bid defiance to anything."

The sequoia is said to be one of the two surviving species of a once numerous genus which, before the Glacial Period, spread across the American continent and occupied Europe as well. The only other survivor is the redwood of the California coast (*Sequoia sempervirens*).

The wonders of the Yosemite National Park are easily accessible via the Yosemite Valley, where accommodations are provided for every degree of income. Desmond camps and excellent government trails enable the visitor to see the giant trees, water-wheels, and canyons, while the more adventurous, who desire to ascend Mount Lyell and its magnificent neighbors, will find entertainment in Tuolumne Meadows, at the hospitable headquarters of the Sierra Club, an organization of mountaineers who have revealed the Sierra to the world. The "General Sherman" tree is in the Sequoia National Park, reached by an automobile trip of 65 miles from Visalia.

Our national parks belong to the American people and are administered by the Department of the Interior. The Secretary, Franklin K. Lane, and the Assistant Secretary in charge of the parks, Stephen T. Mather, realize that as playgrounds for recreation and instruction



Photograph by Gilbert H. Grosvenor

IN THE OLYMPIC FOREST: WASHINGTON STATE

It is worth a trip across the continent just to see the monarchs of the forests of California, Oregon, and Washington. The coniferous forests of these States surpass all others of their kind in the world, not only in the size and beauty of the trees, but in the number of species assembled together and the grandeur of the mountains they are growing on. The placard on the tree is one of the Forest Service warnings about fire. "Observe *the six rules* for the prevention of *fires* in the *mountains*. *Rule One:* Be sure your match is out. Break it in two before you throw it away. *Rule Two:* Don't throw away burning tobacco. *Rule Three:* Make your camp-fire small and in a safe place. *Rule Four:* Put out your fire with water and then cover it with earth. *Rule Five:* Don't make large bonfires. *Rule Six:* If you find a fire, put it out. If it's too big, notify a ranger."

our national parks are without rivals on any continent, and are successfully striving to make them as available to our citizens as Italy and Switzerland have made theirs. Though the parks are remote from the Atlantic coast, they are not so distant as the playgrounds in Europe, and are reached by the tourist much more easily and quickly.

Our country is the treasure-house of nature's scenic jewels, containing so many and such an infinite variety of marvels that thousands of our matchless treasures cannot even be mentioned in this brief article: hot springs, as salubrious as any across the ocean; broad, hard, white beaches like the automobile course at Ormond, superior to any in Europe; coast scenes like those at Mount Desert, Marblehead, Mount Tamalpais, Santa Barbara, San Diego; an inland waterway which parallels the Atlantic coast and is almost continuous from Massachusetts to Florida, with possibilities for aquatic enjoyment unequaled except in our own wondrous Puget Sound; canals pictur-



Photograph by Fred H. Kiser

CROWN POINT, ON THE GREAT COLUMBIA RIVER HIGHWAY THROUGH THE CASCADE MOUNTAINS TO PORTLAND AND THE SEA

"The Columbia, viewed from the sea to the mountains, is like a rugged, broad-topped, picturesque old oak, about six thousand miles long and, measured across the spread of its upper branches, nearly a thousand miles wide; the main limbs are gnarled and swollen with lakes and lake-like expansions, while innumerable smaller lakes shine like fruit among the smaller branches."—JOHN MUIR (see also page 407).



Photograph by Miller

PART OF ONE DOUGLAS-FIR TREE



Copyright by Miller Photo Co.

UPPER KLAMATH LAKE, OREGON, WITH MOUNT MC LOUGHLIN (OR MOUNT PITT) IN THE BACKGROUND

Upper Klamath Lake excels in the profusion and beauty of its water birds. Great snowy pelicans float about on its waters like graceful yachts. There are countless great blue herons, coots, snipe, mallards, kingfishers, and different varieties of ducks, all protected by the game laws of the State of Oregon, whose citizens long ago realized the large asset they had in their wild life and have protected it. Upper Klamath Lake is reached via Klamath Falls.



Photograph by Curtis & Miller

COASTING ON THE SNOW FIELDS OF RAINIER NATIONAL PARK, WASHINGTON



Photograph by Merl La Voy

COLUMBIA GLACIER: ALASKA

Norway contains no fiords or glaciers comparable with many in our own Alaska, nor Switzerland mountains as grand as Mount McKinley



Photograph by Curtis & Miller

A VIEW OF CHILDS GLACIER: ALASKA

Alaska's glaciers are the largest in the world outside of the polar regions



Photograph by Carl J. Lomen

AMERICA'S "LAND OF THE MIDNIGHT SUN"

When Nature passed round her gifts to the nations, even a "land of the midnight sun" was not denied America; for in all that vast territory Alaska lying north of Fort Yukon and the Seward Peninsula the sun never sets in the summer nor rises far above the horizon in winter. The ure shows its position at midnight in summer and at midday in winter.



Photograph by Curtis & Miller

MOUNTAINEERS DESCENDING MOUNT BAKER, WASHINGTON, ON AN ANCHORED LIFE-LINE

No one needs to go to Europe for mountain-climbing, for the United States can offer climbing of any desired degree of difficulty. And what a satisfaction to scale your own mountains instead of somebody's else!



Photograph by Putnam & Valentine

WATER-LILY POND AT HOLLYWOOD, CALIFORNIA

The boy on the right is also giving baby brother a "sail"

esque as any in Holland, such as the mountain gorges and blue-grass pastures of the Chesapeake and Ohio Canal from Washington to Cumberland, or the historic Mohawk Valley of the Erie Canal—a desert with colors as heavenly as those of the Sahara and, though devoid of picturesque camels and Arabs, adorned with the most extraordinary cacti and desert vegetation on earth, and studded with marvelous works of the human hand like Salt Lake City; great fresh-water lakes, on which you can take a voyage of one thousand miles on ocean liners; Alaska, possessing the grandest glaciers in the world outside the polar regions, fiords more impressive than Norway's, and mountains like Mt. McKinley, which towers nearly one mile higher than the loftiest peak in Europe.

Any of our readers could spend an entire lifetime seeing nature's masterpieces within our boundaries and not reach the end of the catalogue.

VOL. XXIX, No. 5 WASHINGTON MAY, 1916

THE NATIONAL GEOGRAPHIC MAGAZINE

FURTHER EXPLORATIONS IN THE LAND OF THE INCAS

The Peruvian Expedition of 1915 of the National Geographic Society and Yale University

BY HIRAM BINGHAM, DIRECTOR OF EXPEDITIONS

IT WILL be remembered that it was in 1911 we commenced systematic exploration in southern Peru, in the country made famous for American readers by Prescott's celebrated classic, "The Conquest of Peru." On that expedition, which was primarily intended to search for the capital of the last Inca, Manco, who had rebelled against the Spaniards and fled into the most inaccessible part of the Andes, we discovered a considerable number of unknown ruins in a virtually unexplored region north of Cuzco. Our most important discovery was that of the wonderful city of Machu Picchu, which had been lost for so many generations that, with the exception of a few local Indians, no one in Peru was aware of its existence.

In 1912 we returned to the same country and spent several months at Machu Picchu clearing it from the forest and jungle and making such excavations as were necessary in order to restore it as far as possible to its original appearance, except that we did not attempt to put roofs on the ruins.*

In the meantime we had also discovered, through the observations of our topographers, that the surrounding country had been previously mapped with such great inaccuracy as to make the region between the rivers Apurimac and Urubamba appear to be much smaller than it was in reality. Owing to the precipitous nature of the mountains and the profound depths of the valleys and canyons (see the illustrations, pages 480-485), it was impossible for us then to penetrate the highlands immediately adjacent to Machu Picchu. We did not know whether there might not be some other place of equal or greater importance; we were unable to state how the people of Machu Picchu entered their city, or whether they had highways leading to other parts of the country.

In 1914 a considerable part of the neighboring region was mapped, some of the ruins which had been first visited in 1911 were surveyed, and, best of all, the presence of an old Inca road leading in the direction of Machu Picchu was reported.

Of their queer record stones, attractive pottery and bronzes, and of what we had been able to discover as to the history of the city by searching the ancient Spanish chronicles, members of the National Geo-

* See "The Wonderland of Peru," with 250 illustrations, in the April, 1913, number of the NATIONAL GEOGRAPHIC MAGAZINE.



Photograph by Hiram Bingham

THE PRINCIPAL BUSINESS CORNER IN CUZCO

On the left are the walls of the convent of La Merced, built in large part of stones taken from ancient Inca structures at the time of the Spanish conquest. The advertisement thereon announces to the people even up in these remote mountain highlands the sufferings of the Belgians and has them come to a benefit for the Belgian Red Cross at the Cuzco motion-picture theater. Prices were high and most of the people were poor, but the theater was crowded. In the middle of the picture are two llamas on their way to the market-place with produce. At the right is the establishment of Don César Lomellini, an Italian merchant, who has befriended our expedition in every way and has for several years acted as our agent in Cuzco without charge. On his wall is the advertisement that exchange on Lima may be bought at par. He is not only a banker, but sells everything from sugar mills to American candy. Further down the street, under the flagstaff, is the Cuzco post-office. The corner balcony of the Lomellini building, upstairs, opens out of Don César's private apartments. The next two balconies, on the left, open out of the warè-room which he put at the service of the expedition.



Photograph by Hiram Bingham

INDIAN BOYS, WITH VERY ELABORATE PONCHOS, VISITING CUZCO

Cuzco is the Mecca of all the Indians in southern Peru, and one of the most interesting sights in its streets are the visitors, whose district may be told by the cut of their garments and the patterns they affect. Here are shown three visitors from a distant province, who were very shy and only with the greatest difficulty could be persuaded to pose for their picture. Had it not been for the good nature of the porter, or *cargador*, who stands at the left, we could never have persuaded them to face the camera.

graphic Society were told in the February, 1915, number of this Magazine.* But of the food or the flora and fauna of those remarkable builders, who constructed splendid granite palaces and remarkable agricultural terraces in this long-hidden corner of the Andes, we were able to give very little information.

OUR PLANS FOR OUR LAST EXPEDITION

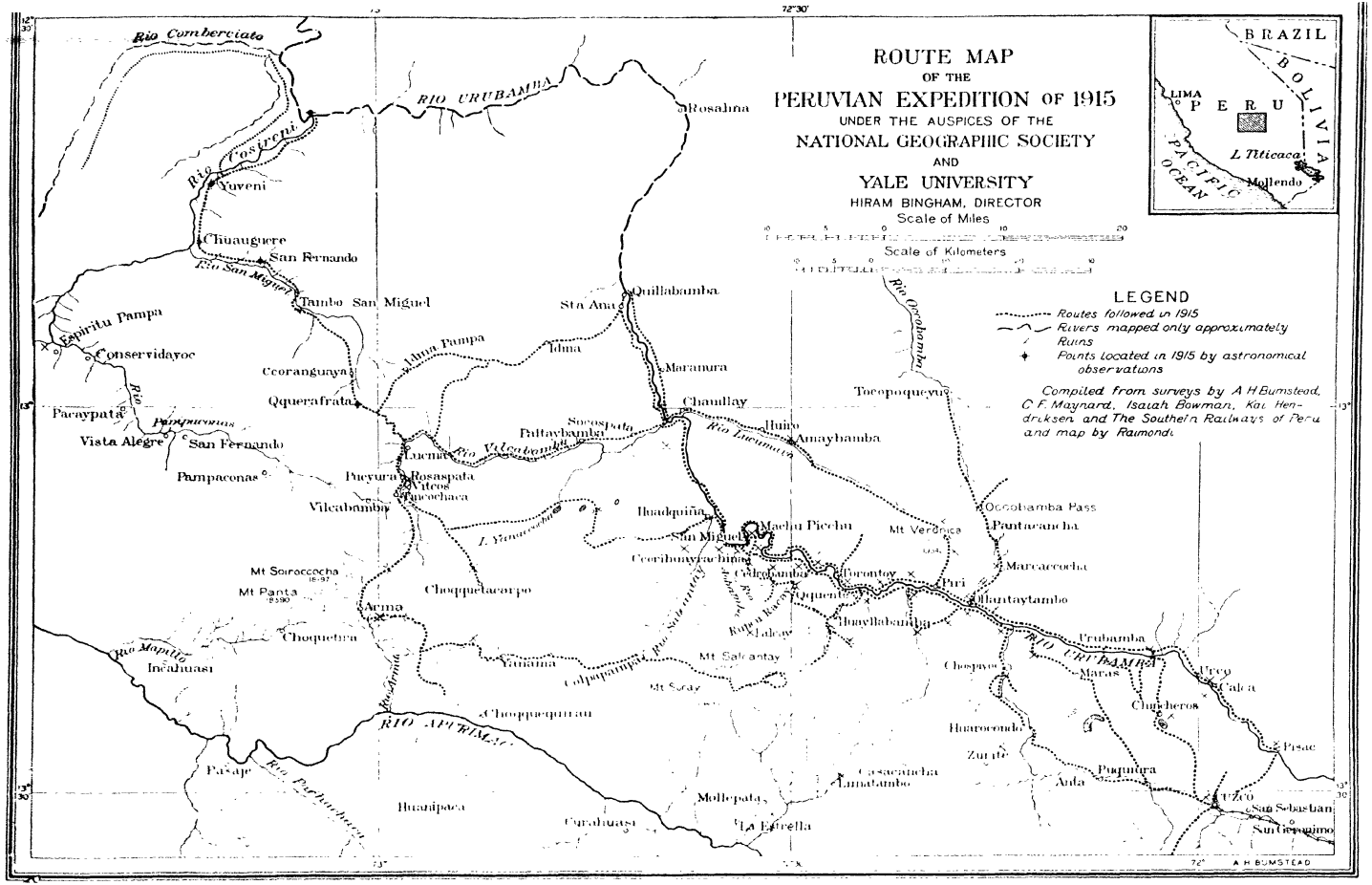
Accordingly, the Expedition of 1915 had for its chief object the securing of as much information as possible about the former inhabitants of Machu Picchu and the territory immediately surrounding the city.

Thanks to the coöperation of the Bureau of Plant Industry of the United States Department of Agriculture, we were able to investigate the original food plants of this vicinity and learn what medicinal plants were known and prized.

We also secured the services of a competent naturalist to tell us with what birds and animals the people of Machu Picchu were familiar. Furthermore, we succeeded in locating several ancient roads leading toward Machu Picchu (pages 446 and 447), and while following them out discovered several new groups of ruins, evidently representing outlying fortresses and fortified stations used for the defense of the capital and for the convenience of travelers on the highways. Finally, by process of elimination, we were able to prove that Machu Picchu was the capital of a considerable area of country that was once densely populated.

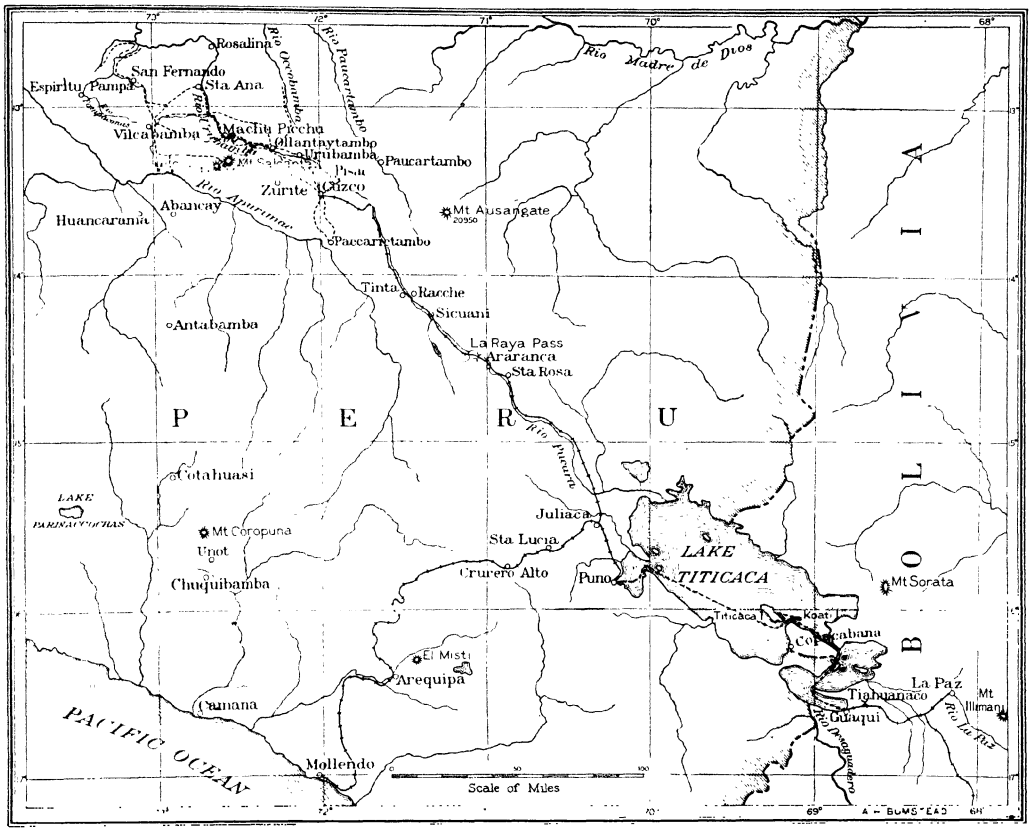
In the course of our work we crossed a number of hitherto-unexplored areas, collected large numbers of botanical and zoölogical specimens, mapped a new river system, and took measurements of nearly all of the savage inhabitants of the newly visited valley, besides many of the semi-civilized folk of the older valleys.

* See "The Story of Machu Picchu," with 60 illustrations, in the NATIONAL GEOGRAPHIC MAGAZINE, February, 1915.



ROUTE MAP SHOWING TERRITORY EXPLORED IN 1915

This map, which is a larger scale representation of the territory in the extreme northwestern portion of the one on the opposite page, shows by dotted lines the routes followed by the Expedition of 1915 in its work of exploring and mapping that section of the highlands of Peru which has Machu Picchu for its center. By locating Cuzco, in the southeastern corner of this map and in the northwestern corner of the other one, the reader can connect them without difficulty.



SKETCH MAP OF SOUTHERN PERU

This map shows that part of Peru in which the National Geographic Society-Yale University Expeditions were particularly interested. The work of the 1915 Expedition was limited to that narrow stretch of territory shown in the extreme northwestern portion of the map west of Cuzco and north of Abancay, and represented in greater detail in the map on the opposite page.

ADVANTAGES OF HAVING A MANY-SIDED STAFF

Since we have now concluded our studies in the region about Machu Picchu, it may be of interest to the members of the National Geographic Society, who have so generously supported these expeditions, to learn something of our methods of work. In explorations in foreign lands a certain amount of time must be wasted. There is tedious work to be done in establishing friendly relations with the foreign government, securing the requisite permits and introductions, forming satisfactory connections with reliable local business houses, purchasing the necessary equipment and supplies, securing efficient and trustworthy native assistants, etc.

The amount of bother and trouble is not materially increased by having a reasonably large expedition, so we have always deemed it decidedly worth while from the point of view of economy to have as many branches of science as possible represented in our party.

There are other obvious advantages to be gained by having men of distinctly different tastes and training working together in a new territory. While each man cannot cover the entire country, his opportunity is broadened by the possibility of one of the other members of the party being able to report to him the



Photograph by Hiram Bingham

PART OF THE LOWER LINE OF FORTIFICATIONS IN THE FORTRESS OF SACSAHUAMAN, NEAR CUZCO

The gigantic size of these huge stones and the extraordinary care and precision with which they are fitted together without mortar or cement by the ancient megalithic builders make this great fortress the most striking monument in the New World to the remarkable perseverance and engineering skill of the American aborigines. This picture shows a small part of the fortress illustrated in the marvelous panorama printed as a frontispiece to this number of THE GEOGRAPHIC.

presence of new material that he would otherwise have missed seeing.

For instance, on this last expedition the most interesting fossil—a portion of the shell of a gigantic antediluvian "land turtle"—was found by one of our civil engineers in the office of a village magistrate whom he was visiting for reasons of diplomacy. The head and skin of a fine puma or mountain lion, the largest and perhaps one of the rarest mammals in Peru, was secured not by the naturalist, but by the surgeon while on a journey to see a very sick priest some 40 miles from our headquarters. Had it not been for the surgeon's willingness to go far out of his way in attending to this call of charity, our collections would not include a puma. It happened that a belt of forest, probably the highest known in the world, was located by the director while on a reconnaissance trip through a region which the botanist was unable to reach. On the other hand, the botanist was the first to observe an interesting feature in the fortress near Cuzco, namely, a groove cut across a cornerstone so as to add to its symmetry by making it appear to be two stones instead of one. The naturalist spent several weeks in an unsuccessful attempt to locate the presence of a spectacled bear, until one was accidentally found by the director while engaged in archæological reconnaissance along one of the old trails leading to Machu Picchu.

Thus it will be seen that a single party, devoted to the study of one subject, is at a disadvantage even in its own specialty, as compared with an expedition composed of several parties of observers trained in various fields of investigation.

The Expedition of 1915 included the following: Hiram Bingham, Ph. D., *Director;* O. F. Cook, of the Bureau of Plant Industry, U. S. Dept. of Agriculture, *Botanist;* Edmund Heller, B. A., *Naturalist;* Clarence F. Maynard, C. E., *Topographer;* David E. Ford, M. D., *Surgeon;* Osgood Hardy, M. A., *Interpreter* and *Chief Assistant;* Elwood C. Erdis, *Chief Engineer;* J. J. Hasbrouck, Ph. B., *Engineer;* Geoffrey W. Morkill, *Assistant in Charge of Headquarters;* G. Bruce Gilbert, of the Bureau of Plant Industry, U. S. Dept. of Agriculture, *Assistant Botanist;* Ricardo Charaja, *Assistant to the Director.*

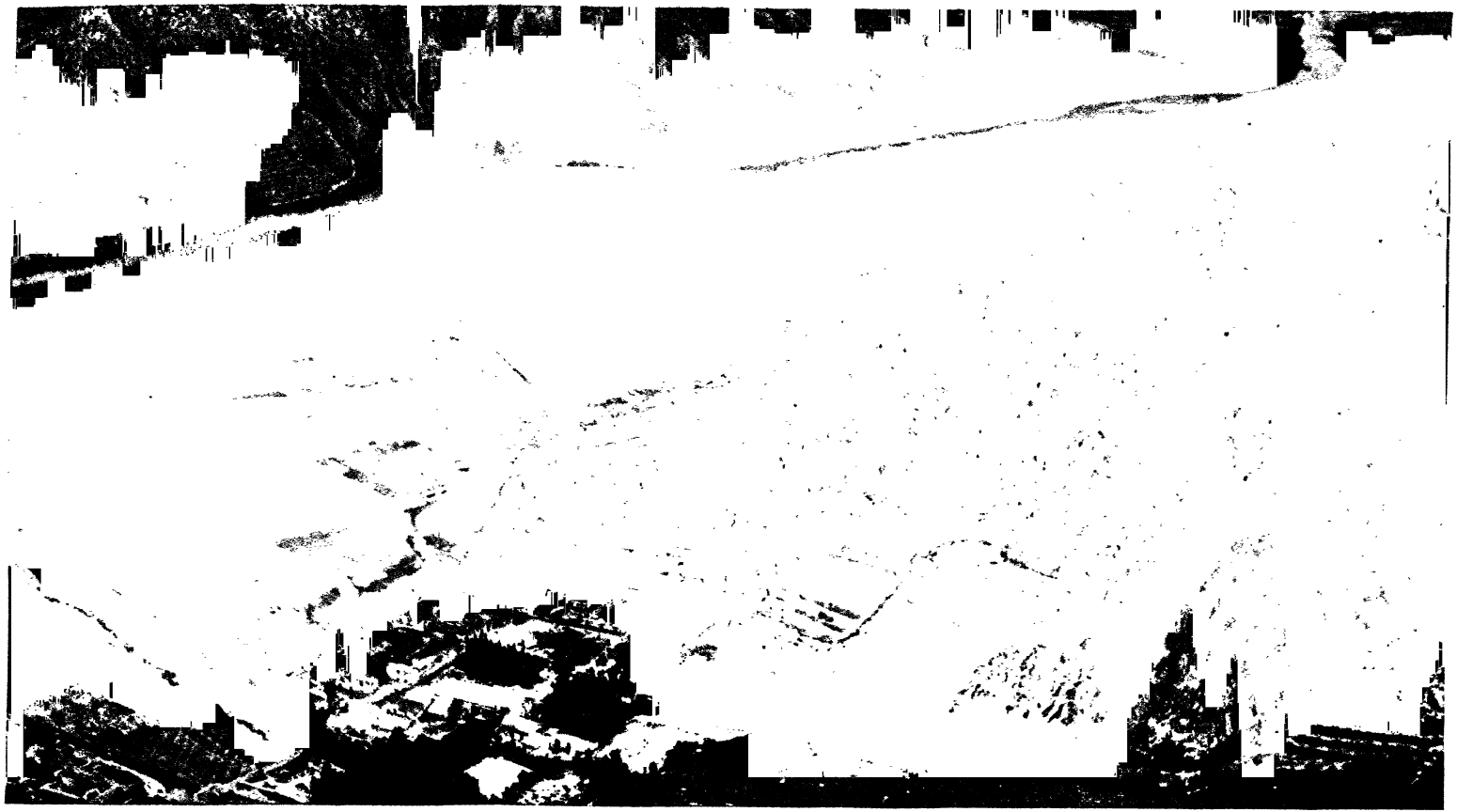
In addition, we had such native guides, muleteers, and soldiers as were necessary. We used 50 mules and 5 horses.

On the 1911 Expedition Prof. H. W. Foote, of the Sheffield Scientific School of Yale University, had coöperated with me in assembling a balanced ration in "unit food boxes." The object of this plan was to facilitate the provisioning of our parties by packing in a single box everything that two men would need in the way of provisions for a period of one or two weeks, depending on the size of the case. We found that the larger box was too heavy, so in 1915 only the smaller size was used. These boxes have given such general satisfaction, not only to the men themselves, but to the surgeons who had the responsibility of keeping us in good condition, that a few words in regard to this feature of our equipment may not be unwelcome at this point.

THE NECESSITY OF VARIED AND WHOLESOME FOOD

Many people seem to think that it is one of the duties of an explorer to "rough it" and "trust to luck" for his food. I had found on earlier expeditions that the result of being obliged to subsist on irregular and haphazard rations was most unsatisfactory. While "roughing it" is far more enticing to the inexperienced explorer than the humdrum expedient of carefully preparing, months in advance, a daily bill of fare that shall be sufficiently varied, wholesome, and well balanced, the results of such "trusting to luck" are very unsatisfactory.

The truth is that providing an abundance of well-selected and properly cooked food adds very greatly to the efficiency of a party. It means far more trouble and expense for the transportation department, and some of the younger men on our parties sometimes feel that their reputation as explorers is likely to be damaged if it is known that strawberry jam, sweet chocolate, cheese, and pickles are frequently found on their bills of fare! But experience has shown that



Photograph by Hiram Bingham

A BIRD'S-EYE VIEW OF OLLANTAYTAMBO

Here the Peruvian Expedition of 1915 made its headquarters, in a rejuvenated Spanish building, seen in the center foreground at the right of the long church. The ruins in and about Ollantaytambo are among the most interesting in South America, and consist not only of fairly recent Inca structures, less than 400 years old, but of megalithic remains of unknown antiquity. The end of the promontory was strongly fortified and almost impregnable. The banks of the Urubamba River in the distance are terraced. The Urubamba Valley at this point is still intensely cultivated on remarkable great terraces that were laid out by the Incas and their predecessors many centuries ago (see "Staircase Farms of the Ancients," by O. F. Cook, in this number).

the results of "trusting to luck" and "living as the natives do" means not only loss of efficiency in the day's work, but also lessened powers of observation and diminished enthusiasm for the drudgery of scientific exploration.

Exciting things are always easy to do, no matter what you are living on, but frequently they produce less important results than tasks which depend upon daily drudgery; and daily drudgery depends upon good daily food.

THE QUESTION OF RATIONS

In 1915 each unit food box, as we have intimated, provided a balanced ration for two men for eight days, breakfast and supper being hearty, cooked meals, and luncheon light and uncooked. It was not intended that the men should depend entirely on the food boxes, but should vary their diet as much as possible by whatever the country affords, which in southern Peru frequently means potatoes, corn, eggs, mutton, and bread. Nevertheless each case contained sliced bacon, tinned corned beef, roast beef, chicken, crushed oats, milk, cheese, salmon, coffee, sugar, rice, army bread, salt, sweet chocolate, assorted jams, pickles, dried fruits, and vegetables. By seeing that the jam, dried fruits, soups, and vegetables are well assorted, a sufficient variety is procured without destroying the balanced character of the ration.

On account of the great difficulty of transportation in the southern Andes we have had to eliminate from the unit cases foods that contain a large amount of water and relatively little nutriment, like French peas, baked beans, canned fruits, etc., however delicious and desirable they may be. We found it possible, however, to add somewhat to the variety by providing in our warehouse at headquarters a few cases of luxuries which could be drawn upon from time to time, including such things as butter, tea, catsup, kippered herring, sausages, and pancake flour. Whenever a party went out for a new trip they were encouraged to take several pounds of "extras" along, in order to break the monotony of the food boxes. Undoubtedly there is much to be gained in keeping up the spirits of the men by providing an appetizing variety on the table.

The most highly appreciated article of food in the entire list was oatmeal, which, on account of being partially cooked, is readily prepared in an attractive manner, even at high elevations, where rice cannot be properly boiled.

On the other hand, it was difficult to satisfy the members of the expedition by providing the right amount of sugar. At the beginning of the field season the allowance—one-third of a pound per day per man—seemed excessive, and the director was criticized for having overloaded the boxes with too much sugar. But after a month in the field the allowance proved to be too small and toward the end of the expedition had to be supplemented.

In addition to the food, we have found it advisable to include in each box a cake of laundry soap, two yards of dish toweling, and three empty cotton-cloth bags, to be used for carrying food, collecting specimens, etc.

PRECAUTIONS AGAINST DISEASE

While the food taken on an expedition largely determines the general health of the members, it cannot entirely take the place of medicines and bandages. Each camping party was provided with a "first-aid" outfit, and every man carried in his personal luggage a pocket medicine case containing quinine, aspirin, bismuth, compound cathartic, bichloride of mercury for wounds, and permanganate of potash for snake bites.

Furthermore, from previous experience we knew that it would be a great advantage to the expedition to establish a small dyspensary at headquarters, where the residents of the vicinity would be welcome and where a small supply of drugs and bandages would always be accessible. We knew that our headquarters would be at least 30 miles from the nearest drug store. Accordingly, our medical equipment was selected with this in mind. In addition, our surgeon was supplied with an African tropical field equipment, carried in a steel chest designed to withstand the hardest kind of usage and to meet all ordinary emergencies.



Photograph by Hiram Bingham

ANOTHER VIEW OF OLLANTAYTAMBO, SHOWING FORTRESS ON THE LEFT AND THE SO-CALLED "SCHOOLS" ON THE RIGHT

As an additional precaution, all members of the party were vaccinated against both smallpox and typhoid, two diseases that are likely to be prevalent in every town in the Andes. The men were particularly cautioned against drinking water taken from irrigating ditches and canals, and against drinking native beverages where the source of the water might be questionable, and against eating too freely of uncooked native fruits and such products as crude native sugar or chocolate.

The general supplies included tents provided with heavy canvas floors sewed to the walls, and mosquito nets, making the tents practically insect- and snake-proof; saddles, made especially for the narrow-backed Andean mules and fitted with cruppers and two heavy girths to prevent slipping on the steep trails; halter bridles (Peruvian saddle animals will rarely, if ever, drink without having the bit taken out of their mouths; so that the halter bridle, with its bit connected by snap-hooks, is a great convenience); pack covers to keep the loads dry during the frequent rainstorms; duffle bags of the heaviest possible material; fiber cases, and air-tight steel boxes.

Besides these things, we were prepared to furnish each member of the party with blankets, snow-glasses, folding bucket, folding wash-basin, cot, aluminum cooking outfit, small kerosene stove with Primus burner, folding brass lantern, sewing kit, canteen, pocket tool-kit, rubber poncho, Winchester rifle, Colt revolver, camera, tripod, and photographic record and calculator.

ESTABLISHING NEW HEADQUARTERS

On former expeditions we established our headquarters at Cuzco, the capital of the Incas at the time of the Spanish conquest, and one of the most interesting cities in the Western Hemisphere.* Since Cuzco is the capital of one of the largest departments in Peru, the site of most of our work, there we had the advantage of being able to keep in touch with the chief political and military authorities whenever trouble has arisen (see page 432).

In 1915, however, we decided to establish our headquarters at Ollantaytambo rather than at Cuzco, because it has a better climate (being at an elevation of only 9,000 feet above the sea instead of 11,000 feet), has plenty of good water—an important factor, considering the amount of pure water needed for photographic purposes, as well as for ordinary household use—and was a long day's journey, or 33 miles, nearer to Machu Picchu and the valleys where most of our work was to be done.

THE HOUSE OF THE YANKEES

Chief Assistant Hardy, who had left New Haven with the Expedition of 1914 and had been spending much of the intervening time studying Quichua, the language of the Incas (at present spoken by a majority of the inhabitants of the highlands), finally succeeded in renting a small place for our headquarters. It was located between the attractive stream which comes roaring down the Ollantaytambo Valley and an irrigation ditch which furnished an abundance of good water. Although not actually in the heart of the town, it was only a few minutes' walk from the telegraph station and was next door to the church and the priest's house (see page 438). Reverting to the language of the Incas, we called it Yankihausi, or the House of the Yankees.

When Mr. Hardy leased the place, there was, besides a garden and a small paddock, only a single building that was considered habitable even by the Indians. There had been other buildings, but they were in ruins and unspeakably filthy. The available building was a two-story structure. It had two rooms on the ground floor, occupied by Indian families and coated with the smoke of decades of cooking fires. One room was pointed out as the place where an Indian woman had once been beaten to death. The doors were low and narrow, so small in fact as to be well-nigh useless for light or ventilation. There were only two windows in the entire structure. Pigs and chickens,

*Peru is divided not into States and counties, but into departments and provinces. The prefects of departments are answerable only to the President and have great power.



Photograph by Hiram Bingham

PACK TRAIN ON THE PLAZA: OLLANTAYTAMBO

The frayed broom projecting out from the wall over the heads of the Indians in the picture is the Peruvian method of telling the world that the place is a public house where beverages of various degrees of alcoholic strength may be had

dogs and guinea-pigs roamed with impunity all over the premises.

The only building materials that could be obtained were adobe bricks of sun-baked mud, to be made from the earth and litter dug up in the courtyard, rough, unsawed Eucalyptus, grown in the vicinity, corrugated iron roofing, and Oregon pine, both of which had to be brought at great expense on muleback from Cuzco.

As a sample of the difficulties encountered in the construction of Yankihausi, Mr. Hardy writes in part:

"At the beginning of the work I had an hallucination that I could apply Yankee methods to the building of 'Yankihausi,' but this faded away after an unsuccessful attempt to teach the peons to use a wheelbarrow! The earth for the mortar was dug up with a short-handled, acute-angled hoe. Much treading served to mix straw with the mud and give it the right consistency. Both mortar and stones were carried to the wall in goat-skins, where they were put in place by a mason whose utensils were a plum-line and a trowel. Two Indians mixed the mortar, three carried it to the wall, and two brought stones; so that seven laborers were employed in tending the mason.

"Furthermore, I was never able to overcome the waste caused by frequent interruptions for meals. Arriving without having breakfasted, the laborers ceased work for an hour in the forenoon to eat. Again at noon work stopped, this time half an hour for chicha and coca. About 4 in the afternoon supper was the excuse for still another rest!

"Throughout the work I was blessed with the friendly criticism of all the 'cavaliers' in the immediate vicinity. Some of this was constructive, but for the most part it was merely destructive and served only to test my powers of courtesy. All agreed that the house could not be finished in the time at my disposal.

"However, in spite of these 'Job's comforters' and such delays as feasts, which made it impossible for the Indians to work certain days, and the excommunication put upon our laborers by the local *cura*, who had conceived some wrong ideas as to the purpose of our coming to Chantaytambo, the work went steadily on, and by April first, after five weeks' work, Yankihausi was finished and ready for occupancy."

A DAILY VARIATION IN TEMPERATURE OF 50 DEGREES

"While the health of the party was generally good," writes Surgeon Ford in his report, "with no serious illness, there were numerous disorders due to or modified by climatic conditions, or by the unusual mode of living.

"Our life was constantly in a country which varied in altitude from 2,000 feet to 17,000 feet; temperatures were encountered varying from 119 °F. to 22° F. Even in the highest altitudes there was a daily variation of as much as 55° F.

"Fleas, lice, and three varieties of biting flies were sources of much discomfort. The prevalence of typhus among the Indians toward the end of the season—one case among our own men—caused some anxiety. Affections of the respiratory passages seem to be the most prevalent diseases in the higher altitudes. There is a universal dread of 'lung trouble.' Typhoid is always present in the towns. Summer diarrhea among the children and dysentery are common.

"Typhus is endemic in the Urubamba Valley. It was epidemic during the latter part of our stay there. I had twelve cases.

"Smallpox is always present and no precautions are taken against it. Most of the adults (of Spanish blood as well as Quichuas) having had it in childhood, are immune, but it is a great cause of infant mortality.

"Open ditches in the streets are sewers, drinking-water supplies, and baths for pigs. Once at our base camp we found a fresh cowhide in our well! It had been put there, as part of a tanning process, by men who had been with two previous expeditions. These men, most intelligent of their class, could not be made to realize that the water might be injured."

There were many narrow escapes occasioned by landslides and bad trails. We lost several mules, but no men. One of our military escorts, Tomas Cubinas, shot himself accidentally through the foot in



THE SIX MONOLITHS OF THE FORTRESS AT OLLANTAYTAMBO

Photograph by Hiram Bingham

Frowning down on our headquarters were the ruins of the great megalithic fortress, the most remarkable feature of which is this wall of six huge blocks of reddish granite; the interstices between are fitted with narrow blocks of the same material. It seems not unlikely that this ancient wall was intended to convey a sense of the majesty of the king who ordered its construction, and also a record of achievement. Although there are no real hieroglyphics to be found on its surface, it will readily be seen that there were at one time very distinct carvings and patterns that have now become barely visible, even in a strong cross-light. Unfortunately, some modern Peruvians have endeavored to achieve immortality by carving their names on these wonderful relics of the powerful megalithic civilization that preceded the Inca empire. The stones were quarried several miles away.



Photograph by Hiram Bingham

INCA PRINCESS' BATH, NEAR 1915 HEADQUARTERS: OLLANTAYTAMBO

August, the bullet passing through his instep and affecting some of the small bones. He has recovered. One day, as Mr. Heller was crossing the Cosireni River on one of the rickety native bridges, which requires a person to proceed on all fours, like an ape, the savage carrying the shotgun exploded it accidentally when midway across, the shot striking between Mr. Heller and the Machiganga Indian. Some of the shot cut the skin of his hand and another landed in my cheek, while the savage was struck below one eye by a shot reflected from the rocks near the bridge.

THE SEARCH FOR OLD HIGHWAYS LEADING TO MACHU PICCHU

The most thrilling moment in my four expeditions into the interior of Peru was at Machu Picchu, on the 24th of July, 1911, when I first saw the Temple of the Three Windows and the Chief Palace.

In order to reach them, it had been necessary to follow an Indian guide through a dense jungle, and finally along precipices where one literally had to hold on with one's finger nails. Clearly this was not the way that the builders of Machu Picchu had approached their city. There was another path on the other side of the ridge, but this trail was also one that could hardly be conceived of as a highway to the city, for in several places it has to depend on rickety little ladders and protruding roots.

Later we located part of an ancient road leading back from the city up the mountain side and across the face of one of the towering precipices on Machu Picchu Mountain. It appeared to proceed in a southerly direction into a region of high mountains, deep valleys, and well-nigh impassable jungles. In 1915 it was my privilege to penetrate that unexplored country back of Machu Picchu, visit its ruins, and follow its ancient trails.

The most important ruin in this region is called by the local Indians "Patallacta," or the "City on the Hill," at a place called Qquente, or "Humming Bird," which was probably the largest city tributary to Machu Picchu. We spent two months executing a careful survey of the town and making small ex-



Photograph by Hiram Bingham

OUR CARRIERS ON THE OLD INCA TRAIL TO THE LOST CITY OF THE INCAS

This trail connected the city of Machu Picchu with some of the more populous valleys in the vicinity and also with the distant city of Cuzco. It was opened with great difficulty by the Expedition of 1915, repaired in some places, and found to lead past several hitherto-unknown groups of ruins of minor importance.

cavations in each of its houses. In no case was it necessary to dig down more than a couple of feet, since what material there was lay very near the surface. This work was under the personal supervision of Mr. Elwood C. Erdis and Mr. J. J. Hasbrouck. Their task was well done.

Notwithstanding the extraordinary stories circulated among the Indians of our discovering gold images and other treasures of great value, no gold of any sort was found in any of the excavations at Patallacta, Machu Picchu, or elsewhere in Peru.

In the immediate vicinity of Patallacta we noticed many signs of ancient irrigating ditches, ruins of smaller villages, and occasionally ruins of well-built houses; but in no case is there anything as good as the best stone-work at Machu Picchu. The marked architectural characteristics of the Machu Picchu buildings, such as houses with gable ends, ring stones, niches, windows, projecting cylinders, and clan groups with lock-holes were well represented.

Not far from Patallacta, in the Huayllabamba Valley, we located the remains of an old Inca road leading out of the valley in the direction of Machu Picchu. It was with mingled feelings of keen anticipation and lively curiosity that Mr. Hardy and I, with a gang of Indian bearers from Ollantaytambo, in April, 1915, set out to discover how far we could follow this ancient road. After passing through a picturesque primeval forest, we came out in the upper part of the valley on grassy slopes, where we had no difficulty in tracing the remains of the ancient highway. It led to a pass at the



Photograph by Hiram Bingham

A PART OF THE OLD INCA TRAIL LEADING TO MACHU PICCHU

In places the trail was held in position by high retaining walls. The gradient was heavy and there were many long flights of stone steps (see page 448).

head of the Huayllabamba, and then down by a series of sharp zigzags into the Huayruru Valley, where not a soul lived and which seemed to be extraordinarily destitute of even wild animal life. It has the reputation of being extremely unhealthy.

We made our way through the bottom of the valley as best we could. The trail disappeared for a while in a maze of boulders and the remains of a fairly recent landslide, but we could see a road winding up the grassy slopes on the other side of the valley. We finally made out two roads and decided to take the one to the right, as that appeared to lead in the direction of Machu Picchu.

WE DISCOVER MANY MORE ANCIENT RUINS

Half way up the mountain side, 1,500 or 2,000 feet above the bottom of the valley, we came to a very interesting little ruin, the name of which the guide, who arrived a little later, told us was Runcu Racay. It was apparently a fortified station on the old highway.

From Runcu Racay the ancient highway led over another pass into the Aobamba Valley. In most places the road was in such condition that the mules could follow it with safety, but occasionally the poor animals would get bad falls and had to be entirely unloaded and helped up slippery or precipitous rocks. We had not proceeded far into the Aobamba Valley before we came to a fork in the road. The left branch led by a series of steps up a precipitous slope to a promontory, where we found a group of ruins, to which our guide gave the name of Cedrobamba. This was probably an important fortress, since it commanded the approach to Machu Picchu. It is surrounded by cliffs and is extremely difficult of access.

We made a small clearing in the valley near the ruins and camped here while the road was being made passable for the

mules. In several places bridges had to be constructed.

While the road was being opened I went on ahead with two native assistants, and was delighted to find that our trail clearly led in the direction of Machu Picchu. Pushing on in the hope of soon getting a glimpse of Machu Picchu Mountain, I stumbled on a group of ruins called "Ccorihuayrachina."

On the mountain side above the ruins a hilltop had been leveled off and a retaining wall built, so as to make it a useful signal station, or primitive fortress. Beneath it we found a huge cave. The next day, on coming around the bluff in sight of this cave, imagine our surprise and delight to see a black "spectacled" bear browsing in the shrubbery. This was the first time that any of us had ever seen an adult Peruvian bear feeding in the open.

The bear was slowly working around the ridge in our direction, and in the hope of getting a near photograph of it I slipped back out of sight and climbed as fast as I could. A rapid climb at that altitude (the elevation was about 12,000 feet) is not conducive to being able to hold a camera steady when the need comes. Unfortunately the bear climbed faster than I did, and, getting to the top of the ridge, was startled by the sight of our caravan approaching. All I saw of him was a momentary glimpse of two big ears and a black snout not 50 feet away. Before I could get the camera focused the apparition disappeared, and by the time I reached the top of the ridge our precious visitor was safely hidden in the densely wooded hillside below the crest of the ridge.

Naturalist Heller, learning of our encounter with the spectacled bear, later came into this region to hunt and secured several specimens of this rare bruin.

From Ccorihuayrachina the trail led along the crest of the ridge, slowly descending toward Machu Picchu Mountain (see illustration, page 480), but when within rifle shot of the city suddenly disappeared; but that did not worry us, for we had actually reached the immediate neighborhood of the celebrated hidden city by what was probably the ancient highway that connected Machu Picchu with Cuzco. In addition, we had also been so fortunate as to locate a number of hitherto-unknown ruins that represent stations at convenient intervals along the road.

A PERILOUS UNDERTAKING

As I had now other matters to attend to, I requested Mr. Maynard to see what he could do to complete the last link of the old road.

Describing his work, he writes as follows:

"We finally picked the trail up in a ruined guard-house farther along the ridge and followed it to a point where the side hill merged into a sheer rock wall. At the difficult places the Indians would try in every way to discourage further search, crying, 'No hay camino,' or 'Manan pasanchu,' meaning that 'There is no road,' 'You can't pass.'

"They worked only half-heartedly and had to be repeatedly encouraged.

"In searching for traces of the trail, one of the men finally uncovered a flight of stone steps buried in rotting vegetable matter. These steps led to a cave, the entrance to which had been concealed by bushes. By carrying their road through this natural tunnel, the Incas had avoided building on the face of the cliff. However, when we attempted to follow this route we found the passage choked by large rocks; the roof had caved in. The only possible means of advance was by swinging a short rustic bridge along the face of the cliff, which seemed rather dangerous and not too feasible.

"Sending a man back to camp for a rope, the rest were set to cutting poles which could be used to span the gap. Projecting from the face of the cliff about ten feet beyond the end of the trail and a few feet above it was a ledge of rock. Growing out of crevices at the end of this ledge, and also at the end of the trail, were two small trees. They were rather unsafe foundations, but they formed the only means of further progress. Poles were laid from tree to tree. One of the Indians then slid across, first having a rope tied tightly about his body, the other end being held by the men.



Photograph by Hiram Bingham

A HILLTOP TEMPLE

Among the ruins of lesser importance discovered in 1915 was this hilltop temple, located in a commanding position about 4,000 feet above the bottom of the Urubamba Valley, near Ollantaytambo.

Small sticks were lashed at right angles to the poles and where possible were wedged into cracks in the face of the wall. Brush and moss placed on this support completed the bridge, which was about two and one-half feet wide.

"After crossing we picked up the trail as it left the cave, until a point was reached where slides and dangerous precipices made further progress absolutely impossible. There was nothing to do now but give up all attempt to get through from this end. I therefore decided to descend into the canyon, go to Machu Picchu by the existing trail, and work back from the ruins toward the old road.

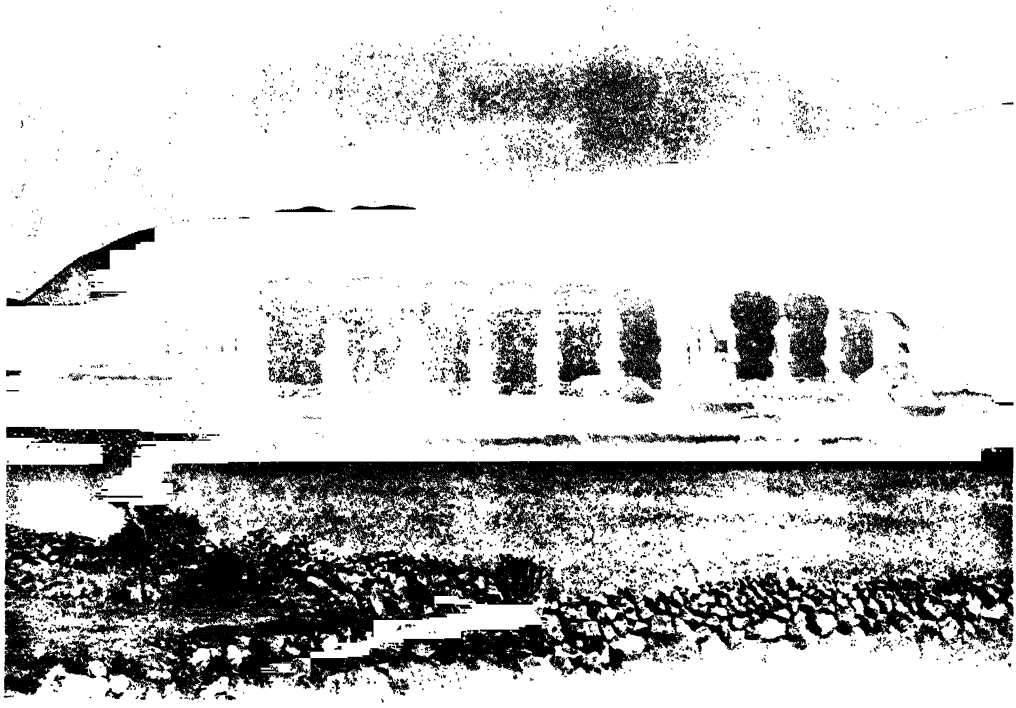
"We finally came across an Inca roadway leaving Machu Picchu by way of a deep gully. Cutting was not difficult here and we made rapid progress. The trail was the finest example of Inca road construction that I had seen. The road finally divided, one branch continuing up the mountain side, the other traversing its western slope. The latter proved to be the desired trail.

"After two days a path was finally driven down the eastern slope to our little bridge and the old road."

A few days later I had the satisfaction of picking up the old road where I had left off some weeks before and completing my journey into the city over all that is left of the ancient highway.

ANOTHER OLD HIGHWAY

The route followed by the early missionary priests on their visit to Vilcabamba the Old—a story referred to in the February, 1915, number of the NATIONAL GEOGRAPHIC MAGAZINE, on pages 180-183—we realized, probably lay across a large, unexplored area, unknown even



Photograph by Hiram Bingham

RACCHE OR RACCHIPATA: VIEW FROM ANOTHER OF THE SPRINGS

The ruins of the Peruvian highlands from the temples to the terraced mountains proclaim a race the destruction of whose annals was a calamity to mankind

to the local land-owners. We had heard rumors that there was a trail by which Indians sometimes came to the ranch of Huadquiña from the village of Pucyura, without going around through the Vilcabamba and Urubamba valleys.

So it was determined to make a circuit from Ollantaytambo, going between the beautiful snow peaks of Salcantay and Soray to the unexplored country lying between Yanama, Arma, and Pucyura, returning by way of the trail to Huadquiña, if it could be found.

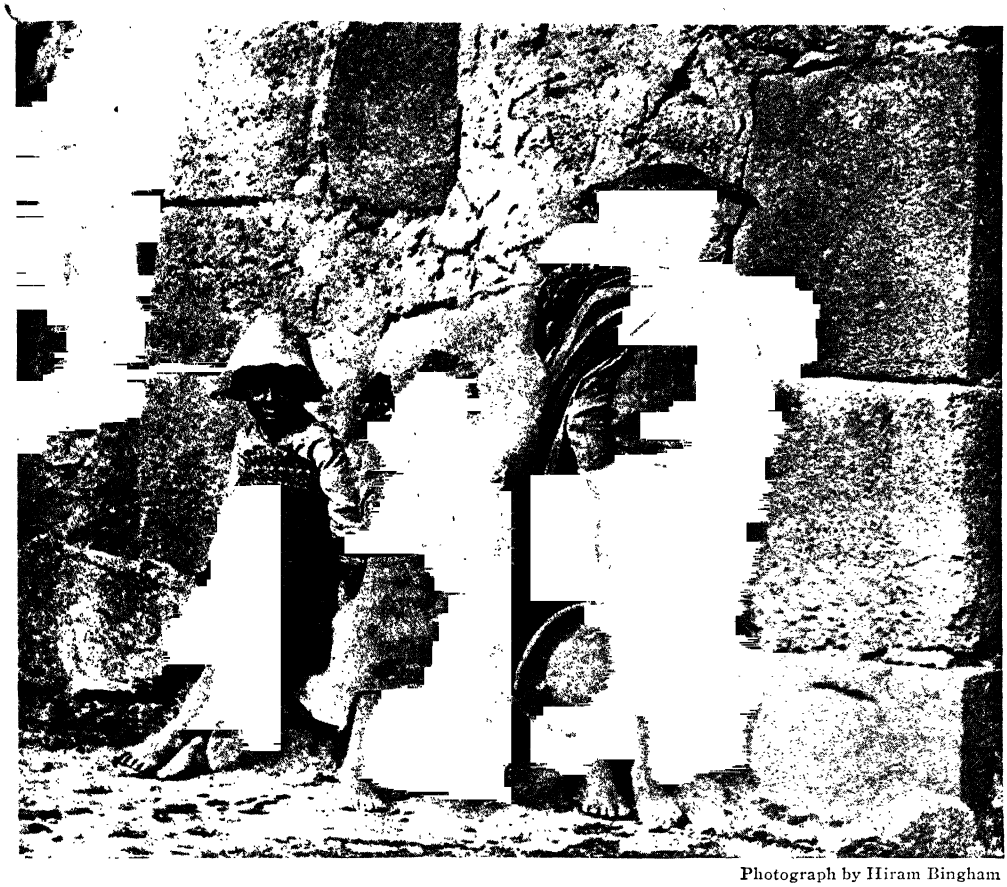
Below Yanama we camped on a ridge near some small ruins. From here we made our way to Arma as best we could without guides, following trails that sometimes led nowhere and that at other times led deep into dense jungles and across mountain torrents.

On this trip I observed near Arma a forest located on the slopes of Mt. Soiroccocha, between 15,000 and 16,000 feet above sea-level—so far as we know, the highest forest in the world.

Near Pucyura, in the Vilcabamba Valley, on the hill called Rosaspata, or "Hill of Roses," where, in 1911, we discovered the ruins of Vitcos, the last Inca capital (see pages 511-520 of the April, 1913, NATIONAL GEOGRAPHIC MAGAZINE), we found encamped Messrs. Erdis, Hasbrouck, and Dr. Ford, of our expedition. They had uncovered an extraordinary amount of modern material, including horseshoe nails, scissors, Spanish brass saddlery decorations, and even jew's-harps, showing that the group of buildings back of the Palace of Vitcos was undoubtedly occupied by Spaniards in the colonial period.

Inquiry among the natives of the valley finally resulted in our securing the services of an Indian guide who said he knew the trail across the unexplored area to Huadquiña in the direction of Machu Picchu.

Our route lay up the Colpa Valley, which I had explored a few days before, passing by an abandoned quartz-crushing



Photograph by Hiram Bingham

CHILDREN BEFORE A BUTTRESS OF THE CHURCH: RACCHE OR RACCHIPATA

Showing the use of ancient carved blocks taken from the neighboring ruins of the temple of Viracocha. Their temples in ruins, their history destroyed, their civilization all but forgotten in spite of the fact that they gave to the present its most productive crop—the potato—the Peruvian Indian is a pitiable descendant of a noble race.

plant and discovering a long stretch of Inca roadway that leads in the direction of Choqquequirau by way of a pass called Choqquetarcarpo. This Inca roadway was in a remarkably good state of preservation, although slides prevented us from using it for our mules. Near it, and not far from the pass, we found the ruins of an ancient tavern, consisting of a group of half a dozen circular houses.

A WILD UNEXPLORED COUNTRY

From the Colpa Valley our guide led us into a wild puna country, where there were many lakes and numerous bogs. Had it not been for the remarkably fine weather of the preceding months, we should never have been able to pass through this region at all; in fact, it is undoubtedly on account of the large number and wide extent of the bogs which characterize this area between Pucyura and Huadquiña that it has so long remained unexplored by the Peruvians themselves.

At last the trail, which in many places followed the lines of an Inca highway, came to a dark green lake, larger than the rest, whose name I inquired of the guide. The answer gave me a thrill. As the guide shouted it back to me from the head of the caravan, I thought he said Ungacacha; in fact, it sounded more like this than Yanaccocha, or "Black Lake," its actual name, as I learned later.

Now, in the account of the journey of the two monks from Pucyura to Vilcabamba the Old just referred to, it was



Photograph by Hiram Bingham

PLOWING IN PERU

The picture shows a potato field being plowed by hand. The women turn the clods after they are loosened by a pair of man-power plows. This appears to represent the aboriginal method of cultivating the soil, but these spades are shod with iron or steel points. The handles are tied to the spades with leathern thongs. It is an Indian custom to hearten labor by working in common, and as many laborers as can be got together work on the same job at the same time. The enthusiasm that comes from working together relieves the monotony of the hard exertion in high altitudes.

stated that they had to pass a place called Ungacacha. Ever since our first journey into this region in 1911 I had been inquiring of Indians everywhere for a locality of that name, only to be met invariably with the reply that they knew of no such place.

It seems to me entirely probable that the place referred to in the Spanish chronicles was Yanaccocha, and that the monk, who probably wrote it down sometime afterward from memory, and who very likely did not hear it any more clearly than I did when I first inquired the name of the place, spelled it *Ungacacha*, instead of *Yanaccocha*. They look so different on paper that it is somewhat difficult to realize how closely the Indian pronunciation of one approaches the other.

That night we camped near a glacier at an elevation of about 15,000 feet and found that our sleep was considerably interfered with by the coldest weather we had yet encountered. The next day one of the mules overestimated the width of the narrow path and fell, carrying his rider with him. Both would probably have been killed by rolling down the precipitous hillside had it not been for the branches of a little tree which held them.

At the junction of two little valleys we found it necessary to turn away from the old Inca trail, which continued up the hillside in the direction of Machu Picchu and led toward the ruins of Yuracrumi-



Photograph by Hiram Bingham

NATIVE CUSTOMS: MESCCAY, NEAR QQUENTE

The mother carries her baby suspended in her shawl from her shoulders. When she wants to get rid of her burden she lines a little pen with the shawl and places the youngster in it. It stays there contentedly for hours.

yocc, which Professor Foote and I had visited in 1911. At that time we could not quite understand its significance, but now it undoubtedly appears to have been a station on the old Inca road between Machu Picchu and the Vilcabamba Valley.

MACHU PICCHU WAS THE CENTER OF A DENSELY POPULATED REGION

It thus appears that the builders of Machu Picchu had an elaborate system of highways throughout this little-known and almost unexplored country which lies between the Urubamba Valley and the Apurimac. This region was once densely populated, and Machu Picchu was its capital. There are no other ruins in the region that approach the Hidden City in magnificence, although there are a great many whose architecture bears a striking resemblance to the less important buildings in Machu Picchu itself.

Further study of the remains found at Machu Picchu has convinced us that we have here an essentially Inca city, using the term Inca in its most reasonable sense—that is, to designate the tribes and nations that occupied the major part of the central Andes from earliest times down to the Spanish Conquest.

The sequence of the various Andean races is extremely difficult to determine. There are no large sandy areas which, by gradually engulfing the life of a village, are later so convenient when the excavator comes to work out its stratification, as in Asia Minor and Babylonia. Landslides may sweep away in a few hours the accumulation of centuries, and overturn everything in such fashion as sometimes to place what is older actually



MAKING BLANKETS ON HAND LOOMS

Photograph by Hiram Bingham

This is an important ancient industry still widely practiced in the highlands of Peru. The picture shows the process of laying down the warp for a large blanket at an elevation of nearly 14,000 feet. The pattern is determined largely by the skill with which the warp is laid down.

above what is newer. The Spanish conquerors were a race of treasure-hunters, and they and their successors destroyed the majority of the evidence.

Lack of timber, the prevalence of heavy rains during part of the year, and the ease with which stone might be procured early led to the development of stone as a building material. Strength and permanence were secured through the keying together of irregular blocks. The upper and lower surface of these stones were frequently convexed or concaved, the convexity of one stone approximating the concavity of the adjoining stone.

In constructing their walls the pure arch was not evolved. They developed several ingenious devices, such as "lock-holes" for fastening the bar back of a door; "ring stones," which were inserted in the gables to enable the roofing beams to be tied on; projecting stone cylinders, which could be used as points to which to tie the roof and keep it from blowing off. The ancient builders also provided for ventilation and drainage (see the April, 1913, and February, 1915, numbers of the NATIONAL GEOGRAPHIC MAGAZINE).

POTTERY LIKE THAT OF GREECE

Sculpture in a rude form existed, but no well executed representations of the human body. They had some skill in copying animals' heads, but at best it was crude in comparison to the skill achieved by the coast peoples. A pair of dishes found in Machu Picchu, bearing as decoration roughly drawn butterflies painted in three colors, represents their highest attainment in ceramic decoration.

Their pottery is marked by simple and graceful lines, bearing a striking similarity to that of ancient Greece, and resembling in its simplicity and utility some of the modern vessels at present in use in French kitchens.

Owing to the extreme moisture of the climate, the remains of cloth are very few; but we know that the Inca peoples actually did arrive at a high degree of skill in the manufacture of textiles through their ability to procure the wool of the alpaca. By the use of hand looms artistic and intricate patterns were produced, and cloth of the utmost delicacy of texture was not uncommon.

Their metal articles were easily preserved, and so we have been able to learn that the people of Machu Picchu were extremely skillful makers of bronze.

The elaborate study of our collections by Professor Mathewson discloses the fact that the more delicate or ornamental pieces contained the maximum percentages of tin, since bronze with a high tin content yields the best impressions in casting.

Professor Mathewson believes that the early Incas were unfamiliar with refined methods of heat treatment, and so were compelled to sacrifice extra hardness and strength by increasing the tin content in large objects, which required considerable working. Apparently cold working was invariably depended upon to produce the final stiffness and hardness of an object. This necessitated a low tin content in such objects as axes, large knives, etc.

TREPANNING OF SKULLS WAS COMMON

Their surgical tools were probably of bronze or obsidian. Surgery appears to have been practiced to a considerable degree, if one may judge by the large number of trepanned skulls that we have found in caves within a radius of 25 miles of Machu Picchu. In some cases the cause of the operation appears to have been disease; in others evidence leads to the conclusion that the operation was intended to relieve pain caused by wounds received in battle. Since the favorite weapon of the Inca peoples was the sling, and clubs were common, it is not surprising that the skulls of many soldiers should have needed the relief that came from skillful trepanning.

In the art of war they exhibit skill in defense rather than offense. Fortifications constructed with salients and reentrant angles so as to admit of lateral fire were not uncommon; high walls, even dry moats, were not unknown. Forts were frequently located on sightly eminences commanding a fine view of all approaches (see pages 438 and 440).

They had no machinery and did not use iron or steel. They used levers and inclined planes. They also made huge



THE PLAZA ON SUNDAY AFTERNOON, SHOWING THE CHURCH BELFRY AND VEGETABLE MARKET: SANTA ROSA

Photograph by Hiram Bingham



NATIVE DRUG STORES OF THIS TYPE MAY BE FOUND IN THE MARKET-PLACES OF ALL THE LARGE CITIES IN THE PERUVIAN ANDES

Photograph by Hiram Bingham

The "druggist," usually a woman, has twoscore or more of remedies, each in a nicely decorated little woven bag. Some of the remedies are useful herbs; others are more fantastic, and include starfish and queer stones. About half of the remedies are supposed to be effective against the bad effects of fresh air and drafts!



Photograph by Hiram Bingham

THE PLAZA AND CHURCH OF PUCYURA ON THE ROAD FROM CUZCO TO ANTA: A GOOD EXAMPLE OF COLONIAL ECCLESIASTICAL ARCHITECTURE

fiber ropes, out of which they constructed long suspension bridges. They thought nothing of handling blocks of stone weighing five tons and upward. Indeed, there are numerous stones that weigh over 15 tons which were fitted together with a skill that has amazed all beholders (see the extraordinary Panorama of Sacshuaman, published as a frontispiece to this number, and also page 436).

It appears that the Incas and their influence throughout the Andes extended no farther north than the known limits of the llamas and the alpacas; in fact, the development of their culture may be said to have depended in large measure on their success in domesticating these varieties of the South American camel so long ago that no wild members of either species remain. Their ability to raise and train hundreds of thousands of llamas which could carry from 50 to 100 pounds apiece enabled the Inca peoples to carry out engineering and agricultural works far more difficult than they could have accomplished had they been obliged to depend on human burden-bearers.

THE SUN WAS THEIR CHIEF DIVINITY

In religion the Incas were fond of worshiping high places, fine views, and other striking natural objects, such as huge irregular boulders, waterfalls, and springs; the wonders of the air and the sky, such as rain, thunder, the starry firmament, the moon, and, above all, the sun. In a cold, mountainous region like the central Andes, it was but natural that the sun, so essential to the raising of crops and to the comfort of shivering humanity, should have been regarded as their chief divinity.

Of literature as such they necessarily had none. Like most primitive peoples, they had remarkable memories. Their language was probably the Quichua. Mr. Hardy, of our expedition, who has been studying it, says that "for one who has not learned it in childhood it is difficult because of the lack of any good grammar in either Spanish or English." He then continues:

"In the fifteen months at my disposal I learned enough to enable me to carry on the conversation necessary to secure information as to trails, ruins, rivers, towns, etc., and to pass some judgment on their orthography.

"My studies make me appreciate the value of Quichua in furnishing sidelights on the life and customs of pre-Spanish inhabitants. The abundance of expressions for all stages of drunkenness shows that the millennium did not exist. The absence of words meaning to buy and sell suggests the simplicity of their industrial life. The importance of agriculture is demonstrated by their having but one word (*llank'ay*) for our words 'work' and 'cultivate.' That they had not gone far in philosophy is shown by the lack of words to denote abstract qualities. 'Pacifism' was evidently known in those days, for *aucca* was used either for enemy or soldier.

"The adjective 'imperceptible' is made up of three words, *acco-sayay-huchaylla,* meaning 'the size of little sand.' An 'incorruptible' man is one who 'does not turn to one side,' *mana-huakllik.* To 'inherit' is literally 'to take the place of the dead one,' *huañukpa-rantin-yaycuy,* while a 'grave' is 'the heart of the earth,' *allpak-soncco.*

"'Experience' is a 'ripe heart,' *pocuscca-sonccoy,* and to 'experiment' is to 'take hold on memory,' *yayay-happiy.* A 'fervent' man is one 'having a beautifully burning heart,' *sumak-raurak-soncco;* an 'inconstant' man has his 'heart on one side.' 'Foreigners' are 'those belonging to a city a great distance off,' *caru-carullaktayoc,* and a 'window' is 'a hole that sees,' *ccahuana-ttocco.*"

So far as one may judge from the present-day music of the Andean peoples, Inca music was a very simple affair, limited to a few notes repeated continually in a minor key.

The family tie was very strong and still is. The extent to which members of a family will go in alleviating suffering and distress of distant relatives is perhaps the most striking and delightful trait in the South Americans of today.

STRANGE THAT SO ACCOMPLISHED A PEOPLE LEFT NO WRITTEN RECORD

Most unfortunate was their failure to develop an alphabet, or even some form



Photograph by Hiram Bingham

THE SCHOOL AT PUCYURA

When we visited the school the session was being held on the veranda, as the day was fine. The schoolmaster may be seen on the right.



SCHOOL CHILDREN OF PUCYURA

Photograph by Hiram Bingham

Nearly all the children are of mixed Spanish and Indian ancestry. They live in houses like those in the background, and others not so good. The children in the picture belong to the wealthiest residents of the vicinity. They are not dressed up for the special occasion; in fact, not even the teacher knew the picture was to be taken until a few minutes previous. This is the only school within a radius of nearly fifty miles, and many of the youngsters live so far away that they are obliged to board in the village.



Photograph by Hiram Bingham

A FLOCK OF YOUNG ALPACAS (WITH ONE WHITE LLAMA, IN THE CENTER, AND SOME SHEEP, TO THE RIGHT) SEARCHING FOR WATER ON THE PLATEAU, 15,000 FEET ABOVE THE SEA

On the high upland pastures between Lake Titicaca and Cuzco thousands of alpacas and llamas find their natural feeding grounds. They have been domesticated for centuries and do not exist in a wild state, but are always attended by shepherds. Alpaca wool is one of the choicest exports of Peru.

of hieroglyphic similar to that which existed in southern Mexico and Central America. It is remarkable indeed that a people who succeeded in equaling the ancient Egyptians in architecture, engineering, pottery, and textiles should have fallen so far behind in the development of a written language. This is the most serious obstacle that stands in the way of our learning more of that enterprising race.

MANY BIRDS LIKE OUR OWN

So much interest attaches to the people who built Machu Picchu that we were extremely anxious to learn all we could of the animals and plants with which these wonderful architects were familiar. What birds did they see? What animals furnished them sport? Which annoyed them? What did they eat? To solve these questions Messrs. Heller, Cook, and Gilbert spent several weeks in camp at the foot of the towering cliffs that defend the Lost City. Writing of his observations, Mr. Heller says, in part:

"Birds in great variety and abundance flitted about our camp and through the neighboring forests. The Urubamba Valley acts as a highway or migratory route for birds between the highlands and the low country. I collected and noted some eighty species.

"Fly-catchers were the most numerous in species, the fifteen kinds which occurred here ranging in character from such familiar forms as our gray kingbird and black phœbe to small forest species of rich rufous tints.

"There was, in particular, a large, pugnacious cliff species and a peculiarly diminutive forest one with a remarkable voice, many times greater than the bird which uttered it.

"Our robin redbreast was represented by a drab brown species of equal size, which haunted the roadside and showed as much confidence in humanity as our bird. The Quichuas call him 'chi-wunk-koo', a name obviously derived from his call note.

"Swallows, resembling our tree-swallows in coloration, were common about the cliffs, while occasionally wandering flocks of a great swift whirled through the canyons.

"The finch family in Peru is a mere remnant compared to the wealth of species in our northern fauna. The tanagers, as a family, were the most abundant and gaudily colored birds with which we met.

"Humming-birds, usually very numerous in Peru, were here represented by only three species, one of them the most diminutive in South America. The size of a bumblebee, in flying it darted away in a straight line with great speed, quite indistinguishable from a bee.

"Another Peruvian bird familiar to the North American is the water ouzel, or dipper, a species of which was found here haunting the streams near rapids at the edge of pebbly bars, often wading thigh deep in the water or diving in shallow pools for insect larvæ. Its body is a rich seal brown and its head white.

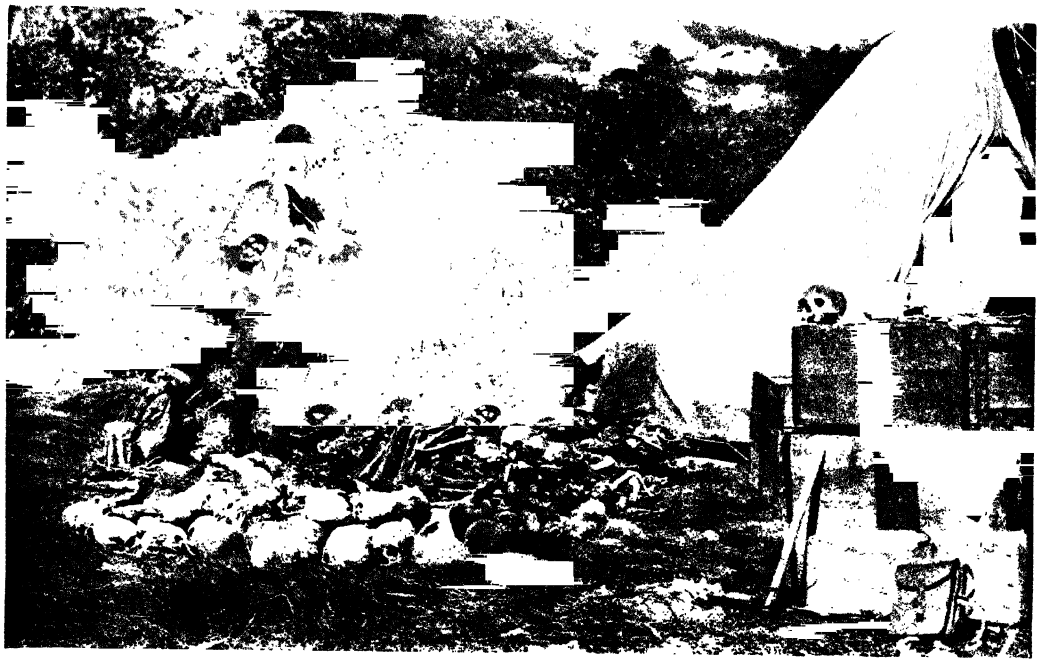
"Among the birds of San Miguel there were no greater advertisers than the large green parrots, which passed overhead in small flocks, every member engaged with his fellows in an animated conversation of hoarse, discordant notes.

"Although we failed to get any bears near the ruins, we did trap a vile-smelling proboscis skunk, known to the Indians as the *anjas*. He dragged himself, trap and all, into a crevice between two rocks. After two shots, he seemed to relax his hold, and, assuming that he had been killed, I instructed my gun-bearer to pull him forth. When the skunk had been dragged into the daylight, we discovered our awful mistake, but too late!

UGLY VAMPIRE BATS

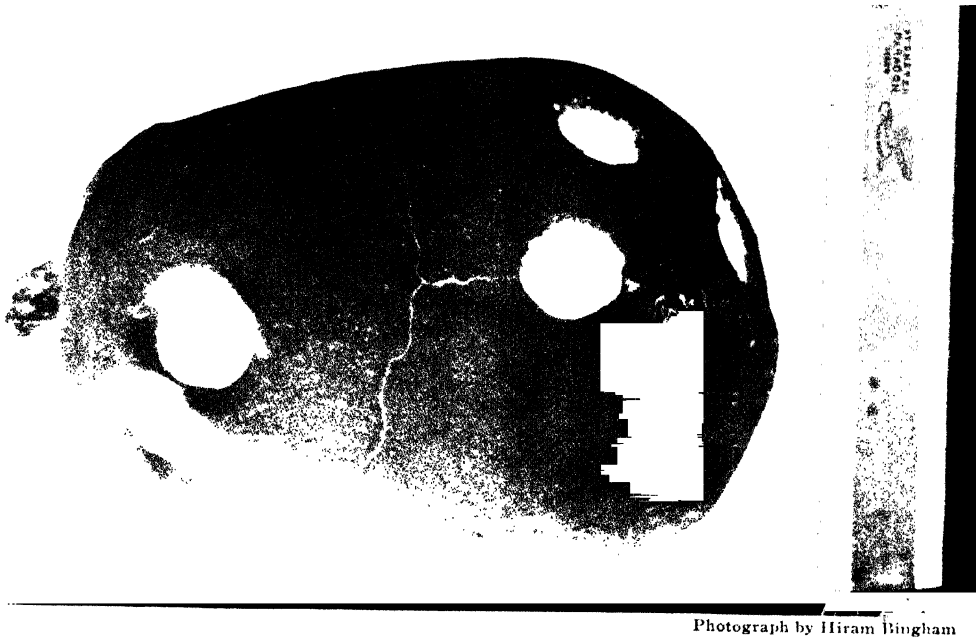
"On the morning after our arrival at San Miguel Bridge the pack-mules nearly all showed blood blotches on their withers and backs, where they had been attacked during the night by vampire bats which had fed on their blood. This bat, *Desmodus rotundus*, is plentifully distributed throughout Peru in altitudes below 10,000 feet.

"It is one of the most highly specialized species of existing bats and is a member of the *Phyllostome* or leaf-nosed group. It has, however, lost its leaf nose to a large extent, owing to its abandonment of an insect diet. The lower jaw is



Photograph by D. E. Ford

MR. HASBROUCK AND THE SKULLS AND MUMMIES FOUND NEAR THE RUINS OF PAUCARCANCHA: NOTE TREPANNED SKULL ON BOX



Photograph by Hiram Bingham

THE MOST REMARKABLE TREPANNED SKULL YET FOUND IN PERU

Having five holes, the edges of which show evidence of healing. We are sure that this patient survived his operation (see page 455).

decidedly undershot, and the head, with its short, cropped ears and broad muzzle, has a strikingly bulldog appearance. The legs are well developed and rather heavy, enabling the animal to move fairly rapidly on the ground, in which situation it is by no means a shuffling, helpless creature like many other bats. If molested when thrown to the ground, it will turn and bite savagely.

"The teeth are a highly modified cutting apparatus for making incisions in the skins of mammals and birds. The cheek teeth, or grinders, have their crowns modified into narrow and high-cutting edges which work against their fellows of the opposite jaw much as the blades of scissors.

POWER TO EAT SOLID FOOD LOST

"Some four teeth only on each side take part in this cutting function, all the other molar teeth being suppressed or actually lost. Possessing teeth of a strictly cutting nature, this bat cannot crush insects, so that it is now actually forced to feed on the blood of other animals. Moreover, the gullet is so restricted or narrow that only blood can be passed through it, and the stomach is weak walled, with the general appearance of an intestinal structure. I have on several occasions examined the stomachs of these bats and have found them to contain only coagulated or clotted blood.

"In size the vampire is somewhat larger than our own common brown bat, compared with which it is a much heavier-built animal. The spread between the tips of the outstretched wings is eight or ten inches, and the length of the body from the tip of the snout to the insertion of the hind limbs is three and one-half inches. In habits they are sociable, and are commonly found living in caves or tunnels, suspended from the ceiling in clusters often of immense size.

"The animals usually attacked by the vampire bat are cattle, horses, mules, and donkeys. Their flight is low and close to the surface of the earth, and doubtless takes place late in the evening, when complete darkness has set in; so that they are, owing to such habits, seldom seen.

"Machu Picchu is locally notorious for the poisonous serpents inhabiting the region in which the ruins are situated. During the work of excavation by the 1912 Expedition several species of the dangerous viper commonly known as the *fer-de-lance,* or *bushmaster,* were encountered. During my trip to the ruins in October another smaller species of viper was secured on the trail. The local Indian guide informed me that during the summer he killed on an average one viper a week.

"The venom of the bushmaster is more powerful than that of any other viper in the New World and is slightly different in quality from that of the rattlesnake, to which it is allied in the general structure of its poison apparatus.

"A much more poisonous reptile, and one found in the same region, is the coral snake, which is armed with venom of the same character as the deadly cobras of Africa and India.

"The city of Machu Picchu is today, as regards its fauna, in much the same condition as during the days of its occupation by the Incas. The commonest birds about the terraces are the crested sparrow, black-headed grosbeak, the goldfinch, gray dove, and brown robin. Condors were seen quite often on the ridge."

The mammals of the ridge are forest types which still manage to live there under the changed conditions. As the city is surrounded by forests for many leagues, it has not been possible for highland mammals of the Andean grass region to reach the ridge by way of any grass-covered tongues or connecting spaces. The mammals known to occur within the limits of the city are the black forest opossum, the spectacled bear, the white-tailed deer, the proboscis-nosed skunk, the brown weasel, a large rodent the size of a woodchuck, a large arboreal or tree rat of the rice-rat group, a rat-like rodent, *Apodon,* and several other smaller rodents.

A WILDERNESS SUPREME

In August a party was organized to explore the so-called San Miguel Valley, which, although occupied for some time by rubber-gatherers, did not exist on any published map of Peru. The party consisted of Naturalist Heller, Topographer Maynard, and Surgeon Ford.



Photograph by Hiram Bingham

INDIANS DANCING IN THE OLD INCA PLAZA AT OLLANTAYTAMBO

This group was composed of six men dressed as usual, except that they wore black shoes, white stockings, colored paper streamers attached to their clothing, and hideous masks on their faces. Their dance, performed to music furnished by a flute and bass and snare drums, was a shuffle. At its close one of them pretended to be dead.



Photograph by Hiram Bingham

INDIANS ABOUT TO COMMENCE ANOTHER DANCE: OLLANTAYTAMBO



Photograph by Hiram Bingham

PART OF THE AUDIENCE THAT ENJOYED THE DANCING ON THE PLAZA AT OLLANTAYTAMBO

After ascending the steep northern slope of the Vilcabamba Valley, the trail continued from the summit down gentle, grassy slopes, encountering the forest again at 11,000 feet.

"From some of the forest openings," writes Naturalist Heller, "we obtained views of the great forest about us. It was a wilderness supreme, from which not even the thin columns of smoke of the camp-fires of savages could be seen. Nowhere else have I ever met with a region showing such little evidence of the presence of man. Finally, the road turned from the ridge and dropped down a steep grade for a league or more to the San Miguel River.

"The next day we came to the meeting point of the San Miguel and the Pampaconas. These two large streams form the Cosireni River, along which we continued to Yuveni."

"Our journey from Yuveni to the junction of the Cosireni with the Urubamba", write Messrs. Maynard and Ford, "took three days. The porters were rather a poor lot, full of malaria, and about two-thirds of them suffering from Oriental sore.

VICIOUS ANTS

"Two varieties of ants annoyed us considerably. The bite of the one—a small red ant—was not serious. One of our guides, bitten in the foot by the other species, suffered intense pain for a number of hours. Not only did his foot give him great pain, but also his leg and hip.

"On our trip three Indians spent one whole night fishing, and had one fish resembling a perch, and weighing about four pounds, to show for their work. All these Indians are inveterate coca chewers. Tobacco leaves are burned and the ashes placed in a gourd, where they are mixed with water until a pasty mass is formed. This mixture is dipped with a stick tipped with cotton, in much the same way that snuff is sometimes taken.

"Two beverages are made, one from yuccas and the other from honey. The first of these I saw being prepared and did not try it. The second, which is called 'milk of flies', I tried and found delicious. A large hairless caterpillar forms another article of the Indians' diet."

Naturalist Heller learned that the best hunting was to be found two days' march further on, in the valley of the Comberciato. Of his experience on this unexplored stream Mr. Heller writes, in part:

"In volume the river is twice that of the Cosireni. On its banks lived several families of Machiganga savages in small open huts. They gathered the rubber sap, which they traded for salt, knives, cloth, etc., as they have no conception of the use of coins and are quite out of touch with the Peruvian civilization of the highlands (see page 472).

MONKEY MEAT A FAVORITE DISH

"The men are keen hunters and fishermen. Their weapons consist of a black, ebony-like bow, made from the outer wood of one of the small, prickly-stemmed palms, and long reed arrows, which have the feathers at the base arranged in a spiral, so as to give a spiral twist to the projectile and greater accuracy to the weapon. Many are also armed with shot-guns, of an ancient, muzzle-loading type, with very long barrels and of small caliber. With these arms they hunt monkeys chiefly, of whose flesh they are very fond.

"Game birds of large size were abundant. In size and color the *tinamou* resembles the common guinea-hen. Its note was a clear, mellow whistle, one of the pleasantest and most characteristic sounds of the forest during the early morning, and again at dusk. Several species of large turkey-like birds, known as *curra-sows*, were often met. One of these was a heavy, glossy-black bird the size of our turkey, with a high, coral-red bill. On several occasions we saw it about the huts of the savages, thoroughly domesticated and at liberty.

"Parrots of many species were seen. Giant macaws were numerous and paroquettes abundant. A yellow-winged parrot, with remarkable ability as a linguist, was seen in a few localities.

"All of these species were seen domesticated or as pets about the huts of the Machigangas, who were very fond of the society of wild animals and showed



AN OPEN-AIR THRESHING FLOOR NEAR HUAROCONDO, PERU

Photograph by E. A. Meserve

The Biblical injunction against the muzzling of the ox used in treading out the grain on the threshing floor seems to be followed in the letter among the Indians of the Inca country. But their custom of hitching three or four oxen together with head yokes leaves them powerless to eat except under what is known in legislative parlance as "unanimous consent."

much affection for them. They were exceedingly gentle with their pets and were never seen to strike them or to show anger at any misbehavior on their part.

"Considerable hunting was done at night with a reflecting lantern of high power. These nocturnal rambles yielded specimens of red deer, several species of night-prowling carnivorous animals, opossums, and a peculiar night snake of the genus *boa*. The eyes of this snake were quite luminous and could be detected at a distance of 20 yards or more. The body was distinctly compressed, like that of a fish, instead of being circular in outline. The head was large and arrow-shaped, and armed with long teeth in the upper jaw, giving it a close resemblance to such poisonous snakes as vipers. The snake was light gray, resembling the bark of many forest trees; but on the back it was marked by large diamond blotches of a brown color.

"The largest specimen obtained, some 6½ feet long, was shot at 10 o'clock one night, hanging with its head within a foot of the ground and close to a small spring of water in the forest, which was a favorite resort for small mammals and other animals. This snake, after being rendered harmless by a shot in the head, coiled its body about the barrel of my shot-gun and exhibited such powers of constriction that it could scarcely be pulled loose again.

"Some 30 specimens of monkeys were collected, representing six different genera, with a single species to each. Besides the monkeys, two species of rare carnivorous mammals were obtained."

The complete zoölogical collection consists of 891 specimens of mammals, representing some 80 species, and 695 specimens of birds, representing some 400 species, besides several tanks filled with reptiles and batrachians. Of snakes there are some 15 or 20 species, of which 5 are vipers. There are 100 or 200 specimens of fishes, most of them of small size.

RICH IN FOODS

The botanists spent three weeks in the canyon near Machu Picchu and found the region particularly interesting, because it represented the border line between tropical crops and those of the temperate zone. The people of Machu Picchu, by going down the valley, could raise well-known tropical fruits like alligator pears, custard apples, guavas and papayas, and tree tomatoes. At the present time coffee, cocoa, bananas, sugar-cane, oranges, limes, and lemons can be grown in the valley not far below Machu Picchu. Whether any of these last-named vegetables were known to the Incas is very doubtful. On the other hand, they did grow in these tropical valleys cotton and coca, from which we derive the extract cocaine.

By going up the valley a few miles on the other side, such temperate-zone plants as potatoes in large variety, many kinds of Indian corn, and a considerable number of food plants that have not as yet been domesticated in the United States, could be grown in profusion.

Although Machu Picchu is thus shown to have been remarkably well situated strategically from the food point of view, the builders were greatly handicapped by the small amount of flat, arable land. As a result, they built terraces everywhere, and the extent to which they carried the construction of these small garden plots is even more extraordinary than we at first supposed it to be. Mr. Cook says in his report that "every spot where plants could be made to grow appears to have been utilized" (see the original paper by Professor Cook beginning on p. 474).

MODERN INDIANS OF THE LAND OF THE INCAS

Studies of the modern Indians, particularly in the Department of Cuzco, were made by Surgeon Ford and Chief Assistant Hardy. While Dr. Ford had to deal chiefly with Indians who came to consult him on account of their health, he made it a point to take measurements of as many subjects as were willing to submit to the "white man's medicine" of measuring-tape, calipers, and camera. Mr. Hardy gave his special attention to the general subject of the manners and customs of this region. Owing to the necessary limitation of space, I can only quote from a few paragraphs of their reports.



Photograph by Edmund Heller

THE MACHIGANGA INDIANS: PERU

These Indians gather rubber sap which they exchange for salt, knives, cloth, etc. They have no conception of the use of coins. Their weapons consist of bows and arrows and antiquated muzzle-loading shot-guns. They are very fond of monkey meat (see page 460).

"Anthropological measurements and observations were made by the Hrdlicka method. This necessitates approximately fifty notations and two photographs. Furthermore, it has the advantage of requiring but little removal of clothing and consequent exposure of person.

"As in former expeditions, the Quichuas were found to be very difficult to handle. They have an instinctive fear of the camera and a deep suspicion of the foreigner. Those living far from the main trails, who come little in contact with strangers, can seldom be persuaded to pose for portraits. They cannot be bribed or bought. They have little desire for money. They will not argue the question; simply turn their backs or run. There is a belief among them that the camera sees through their clothing and takes them in the nude.

"Along the more frequented lines of travel and in the small towns, especially after a few days of association, or by gaining their confidence through medical treatment, I could persuade many to pose for their portraits. Interest in their ailments and sympathy for their troubles would buy almost anything, from anthropological measurements to mule feed. By these methods and the occasional use of empty tin cans, cracker-boxes, and small silver coins, 153 Quichuas were measured—90 men and 63 women—and nearly as many photographed.

"The men were keen in the use of the dynamometer, the interpreter having explained that the one who put the needle the highest was the best man."

Southern Peru may be divided into three zones, based on altitude. These are: first, the highlands, the country devoted to grazing and potato-raising, 12,000 feet or more in altitude; second, the cereal belt, between 7,000 and 12,000 feet in altitude; and, third, the belt of tropical

agriculture, which is below 7,000 feet in altitude.

"The occupations of the highland Indian are stockherding and potato raising." Writes Mr. Hardy, "the stock belongs to the owner of the finca, but the Indian is allowed to pasture his own sheep and cattle with the rest. These are not many, although I found one Indian who claimed to own forty sheep, fifteen cows, and two pigs. He paid ten soles, or $4.80 gold, a year rental and had to work one week each year for the finca owner. They move as lack of pasture may demand, but always to some spot as wild and desolate as that from which they came.

AN HONEST RACE

"The Indians of the highlands have the purest blood and are much more attractive than those of the montaña or slopes. Bronze skinned, of medium height, but with huge chest expansion and wonderful leg development, some of the men of the highlands present a striking appearance. Those of the lowlands, although lighter in color, are generally more ill-favored and lack the ruggedness of feature possessed by those of purer blood. They are smaller, less healthy, and show more marks of dissipation. The pure-blooded women are rarely attractive, yet in Urubamba they are more attractive than the men and have more regular features. Practically all the natives have dark hair and eyes.

"In the uplands both men and women keep to their old styles of clothes, but as one goes down modern styles appear, until in the tropical belt the stiff, broad-brimmed hat and hand-woven poncho have disappeared entirely. Skirts get higher along with the altitude, until at some places they scarcely reach the knee, and give a decidedly fashionable effect.

"In the highlands the woman's hat closely resembles the man's (usually a bit smaller in circumference), but she never wears the woolen skull-cap. To match the poncho she has a *lliclla,* or shawl, the upper corners fastened in front with a silver pin or topo, usually possessing the shape of the bowl of a soup spoon.

"I found the Indians quite honest. Only two or three small articles were lost during the construction of our house at Yankihausi. It was the custom to pay their wages in advance, and we never met with very much disposition on their part to fail us.

"The Indians' only pleasures are beastly carousals. The children have no toys and are almost never engaged in play. As soon as they are able to walk they are set to work. They are early taught to collect firewood and forage wherever they can. Several times in Ollantaytambo I saw a little girl, who could not have been over three years old, driving home a sheep loaded with small branches which the child had collected for firewood."

The result of our four expeditions leads me to conclude that the Peruvian Indian is worth study and development. While it must be admitted that they seldom bathe and have some filthy habits, this is partly the result of living in the cold of the Andes and partly due to ignorance.

If the government of Peru would follow the example of the United States government in making it a crime to sell alcohol and cocaine to the Indians, its revenue would be greatly curtailed; but there is no question that ultimately the country and the Indians would both be far better off.

STAIRCASE FARMS OF THE ANCIENTS

Astounding Farming Skill of Ancient Peruvians, Who Were Among the Most Industrious and Highly Organized People in History

By O. F. Cook

Botanist of the National Geographic Society–Yale University Expedition to Peru in 1915, and of the Bureau of Plant Industry of the Department of Agriculture

AGRICULTURE is not a lost art, but must be reckoned as one of those that reached a high development in the remote past and afterward declined, and has not yet recovered its ancient prestige. The system of agriculture developed by the ancient Peruvians enabled them to support large populations in places where modern farmers would be helpless.

The most specialized development of agriculture in the Western Hemisphere was attained, unquestionably, in Peru, and the culmination was reached centuries ago, before Columbus discovered America. Still farther back there must have been a period of slow and gradual development—a period to be expressed in millenniums rather than in centuries. *At a time when our ancestors in northern Europe were still utter savages, clothed only in skins, and living by hunting and fishing, settled agricultural communities must have existed in the Peruvian region,* perhaps in the same valleys that contain the marvelous remnants of the prehistoric art.

The people who did the finest of the ancient work are not only gone and forgotten, but lack even the distinction of a name. Written records like those of Egypt and Assyria are lacking in Peru, and even tradition has failed to attach names of kings or nations to many of the ancient monuments. Some writers refer to the builders as Megalithic or Big-Stone people, because they used very large stones, like the fabled Cyclopes of the ancient Greeks, who built massive walls and worked in metals. Other writers refer to the ancient Peruvians simply as pre-Incas, because their work evidently belongs to an age farther back than the Inca empire conquered by the Spaniards.

As a race, it may be assumed that the Megalithic people were ancestors of the modern Quichuas, or at least of the same stock, for there is nothing to show that the human type was different in ancient times. In Peru, as in ancient Egypt, it was the custom to mummify the dead and to bury with the mummies the clothing, food, household utensils, weapons, and other objects and articles used by the living.

This regard of the ancients for their dead, together with the dry, equable climate, have made Peru a veritable treasure-house of archæological material. Not only the skeletons and the other physical features of the ancient people are known, but also the nature and degree of development of all of the arts that could be preserved by burial. The general result of such studies tends to show that the modern Quichuas, the Incas conquered by the Spaniards, and the pre-Inca or Megalithic people were all of the same race and practiced the same arts, including the art of agriculture.

The Incas had a very specialized agriculture, but their predecessors had some of the agricultural arts still more highly developed. They built larger terraces and faced them with larger stones, fitted with wonderful accuracy. The Incas also built extensively, but generally with less skill, or at least with less labor, bedding their stones and plastering their walls with clay, instead of taking the trouble to work down and fit together the huge irregular blocks that characterize the Megalithic period.

Like Egypt in the later dynasties, the Peruvians of the Inca age appear to have declined somewhat from the standard of industry, patience, and perfection indicated by the stone work of the earlier period. In other respects progress may have been made. Thus the Incas may have been better organized and more efficient from the standpoint of government and military activity, as were the Romans in comparison with the Greeks. The modern Quichuas are still an agricultural and pastoral people, but they show no tendency to imitate the constructive undertakings of their predecessors.

STAGES OF AGRICULTURAL PROGRESS

In order to appreciate the high development of the ancient agriculture of Peru, we have to consider briefly the stages that mark the progress of agriculture from the simplest beginnings to the most advanced expression of the art.

In the most primitive form of agriculture, still widely practiced in the tropics, the land is not permanently or continuously occupied. New clearings are made every season by cutting and burning. Corn is planted and harvested, and then the forest growth is allowed to spring up again. This nomadic system of annual cornfields, or *milpas*, as they are called in Central America, is practiced in all tropical countries of low elevation.

Tillage agriculture is the next stage. In order to use land for more than one season, tillage is necessary, at least to the extent of stirring the surface soil and destroying weeds, so that seeds can be planted.

A third stage is reached when tillage agriculture is improved by the application of manure, fish or seaweeds, or by using decayed vegetable matter or "green manure" to increase the fertility of the soil. Another step beyond tillage, with or without the use of fertilizers, is irrigation—the artificial application of water to the soil. Irrigation must have begun in regions where it was easy to supplement the natural rainfall by diverting streams, as in the steep mountain valleys of Peru.

Doubtless all of the preceding forms of agriculture were represented in Peru in ancient times, as they are at the present day; but they must have had relatively little importance in comparison with a type still more advanced—a type quite unknown to the American farmer and scarcely to be seen in the United States, except to a very slight extent in ornamental grounds. This most specialized type of agriculture includes all of the preceding features — tillage, fertilizing, and watering the crops; but another is added—the artificial construction of the soil on which the crops are grown. *In the valleys where the ancient Peruvian agriculture was centered, most of the agricultural land is not natural soil, but has been assembled and put in place artificially* (see also page 494).

MARVELOUS TERRACE AGRICULTURE

This most specialized type may be described as terrace agriculture, and is seen in its most conspicuous form when narrow terraces are built on steep slopes. Such terraces are found in many other countries, though it is doubtful whether any equal those of Peru. In Peru the artificial reconstruction of the soil surface was not limited to the terraced slopes, but was also undertaken in large areas of reclaimed land in the bottoms of the valleys. The courses of the rivers were narrowed and straightened by strong walls, and then the land behind the walls was filled in, and finally a surface layer of fine agricultural soil was put on.

The entire region that represents the chief center of the Inca empire and its Megalithic predecessors affords very little of the level or gently sloping natural soil that we would consider well suited to agriculture. Most of the level land is on the high plateaus, where the climate is too cold or too uncertain for the growth of crops, so that planting is confined largely to the slopes to avoid the danger of frosts in the growing season.

To us in the United States this laborious construction of the artificial lands in the warmer valleys seems almost incredible. Even irrigation agriculture appears to us as a new and very specialized branch of the art, and we think ourselves very enterprising to have undertaken the

reclamation of our so-called "deserts" in the Western States, where wide expanses of nearly level and very fertile soil have been made richly productive simply by being supplied with water. The native agriculture of Peru reached the stage of reclamation projects long before America was discovered by Europeans. *Our undertakings sink into insignificance in the face of what this "vanished" race accomplished.*

The narrow floors and steep walls of rocky valleys that would appear utterly worthless and hopeless to our engineers were transformed, literally made over, into fertile lands, and were the homes of teeming populations in the prehistoric days. That the work was well done there can be no possibility of doubt, for many thousands of acres of these artificial lands are still fertile and are the chief support of the modern population of the valleys. The native people take the amazing works of the ancients as a matter of course, as we accept the natural features that surround us, and are no more inclined than we are to such impossible undertakings as the ancient people accomplished.

That the ancient people should have taken to terrace-building is not difficult to understand in the presence of the natural conditions where the art developed. With an agricultural population becoming crowded in steep, rocky valleys, the removal and piling up of the stones to give more room for plants would be a most natural step for a primitive people to take. In the early days the building of terraces may have appeared simply as an effective way of disposing of the stones and leaving the largest area of tillable land after the work was done. If there were more stones than could be used in building the walls, the surplus could be disposed of by placing them behind the walls to form a porous subsoil for the surface layer of fine earth where the crops were grown. More land could be cleared by building the stones into walls than by merely throwing them into piles. The desirability of piling the stones or building the walls so that they would hold the soil in place and prevent washing would also become apparent.

The most strikingly artificial feature of the ancient Peruvian agriculture was the covering of steep slopes with narrow terraces, supported by stone walls and watered by aqueducts built for many miles along the precipitous slopes of the mountains. Some of the terraces, those that characterize the Megalithic Age of Peru, were built of enormous stones, often of very irregular form, fitted together with wonderful nicety.

The labor expended in the construction of these terraces shows that they served some purpose that the builders considered very important. We learn from the early Spanish historians that the Incas had special gardens for raising the potatoes of the royal household, and that there was a general belief among the people that the growth of crops and the fecundity of the flocks were acutely dependent upon the welfare of the royal family. Hence there was an underlying practical reason for the deep solicitude of the people, so often remarked by the early historians, "That it might be well with the Inca".

COMPARED TO THE HANGING GARDENS OF PERU, THOSE OF BABYLON WERE INSIGNIFICANT

The hanging gardens of Babylon have long been reckoned as one of the wonders of the Oriental world; and yet they were a mere transient toy and for 3,000 years have been only a tradition. The hanging gardens of Peru, though of unknown antiquity, are still in existence, and doubtless as worthy of our admiration as were those of Babylon in the days of Herodotus and Strabo.

The Babylonian gardens are said to have been 400 feet square and as high as the walls of the city, variously stated at from 75 to 300 feet. The structure had the form of a pyramid, with broad steps, on which earth was placed for the growth of plants. No doubt such an artificial hill was a striking object in the plain of Babylon, and gave Nebuchadnezzar's Median queen a pleasant reminder of her mountain home, where, it may be, there were valleys with terraced slopes as in Peru.

Many banks of terraces in Peru are very much longer and very much higher



Photograph by Hiram Bingham

MT. VERONICA, 20,000 FEET HIGH, THE URUBAMBA RIVER, AND THE MAIN VALLEY ROAD

A portion of the pack train of the National Geographic Society-Yale University Peruvian Expedition of 1915 in the foreground.



Photograph by Hiram Bingham

THE GRAND CANYON OF THE APURIMAC

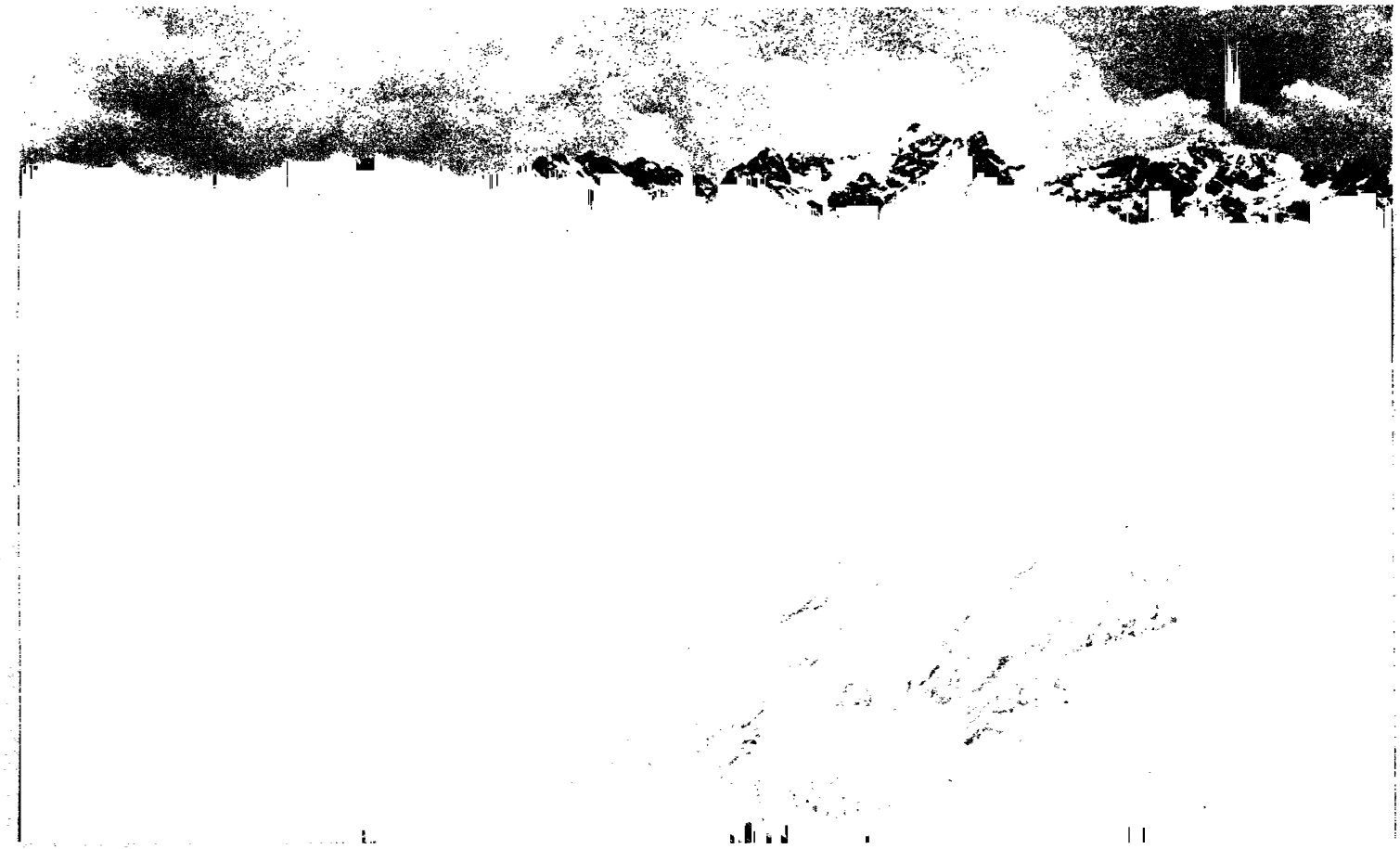
A bit of the Apurimac Valley between La Estrella and Abancay. If the Pan-American Railway is ever completed, one of the most interesting sections and one involving tremendous engineering difficulties will be in this immediate vicinity, where the road from Cuzco to Lima crosses this magnificent tributary of the Amazon.



Photograph by Hiram Bingham

AN ARTIFICIAL WATERFALL CONNECTING TWO ANCIENT IRRIGATION DITCHES IN THE HIGH COASTAL DESERT OF SOUTHWESTERN PERU

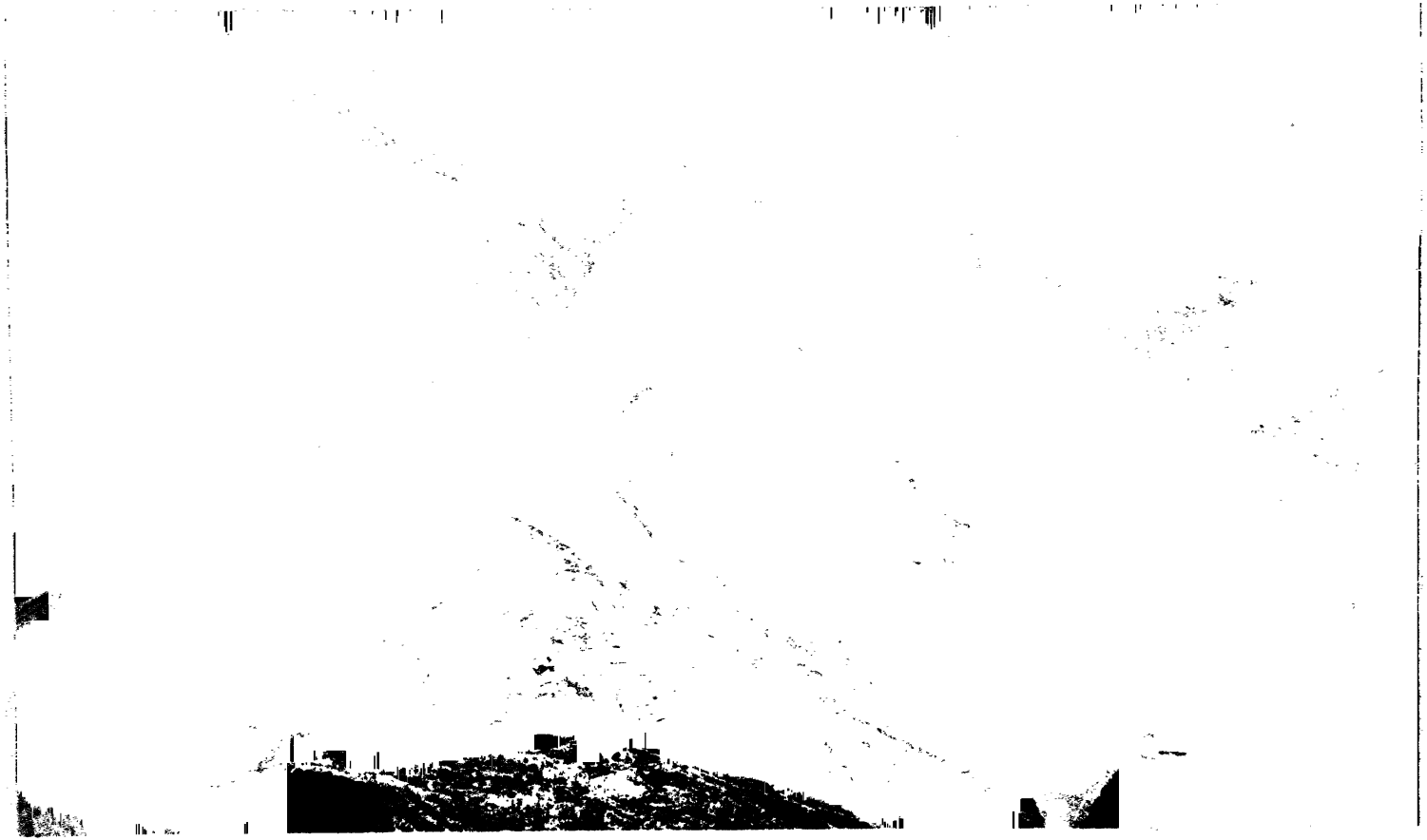
Numerous irrigation channels were carved along the steep mountain slopes, often for long distances. The courses of rivers were straightened, and many square miles of artificial land were constructed in the bottoms of the valleys with an expenditure of labor almost inconceivable.



Photograph by Hiram Bingham

THE NARROW RIDGE ON WHICH MACHU PICCHU IS SITUATED AND THE MAGNIFICENT URUBAMBA CANYON

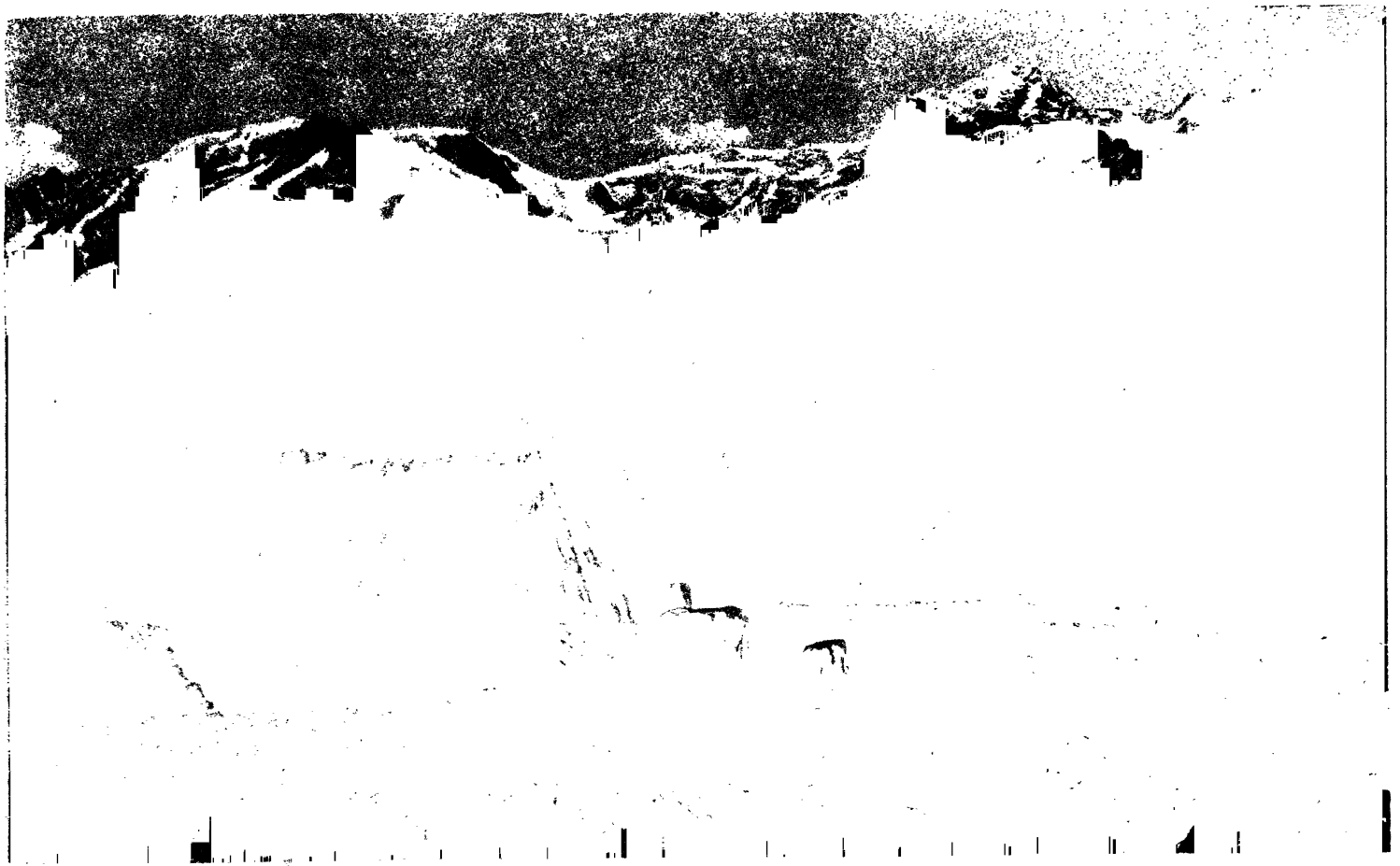
A distant view of Machu Picchu on its narrow ridge, flanked by precipices, in the most inaccessible corner of the Andes, in the heart of the Urubamba Canyon. The sharp peak in the right foreground is Machu Picchu Mountain. The lower conical peak at the extreme left is Huayna Picchu. The city of Machu Picchu is on top of the ridge between these two peaks and almost directly underneath the little fleecy cloud which hides part of a distant mountain.



Photograph by Hiram Bingham

BIRD'S-EYE VIEW OF HUAYNA PICCHU MOUNTAIN AND MACHU PICCHU RUINS BEFORE MUCH CLEARING HAD BEEN DONE BY THE NATIONAL GEOGRAPHIC SOCIETY–YALE UNIVERSITY EXPEDITIONS

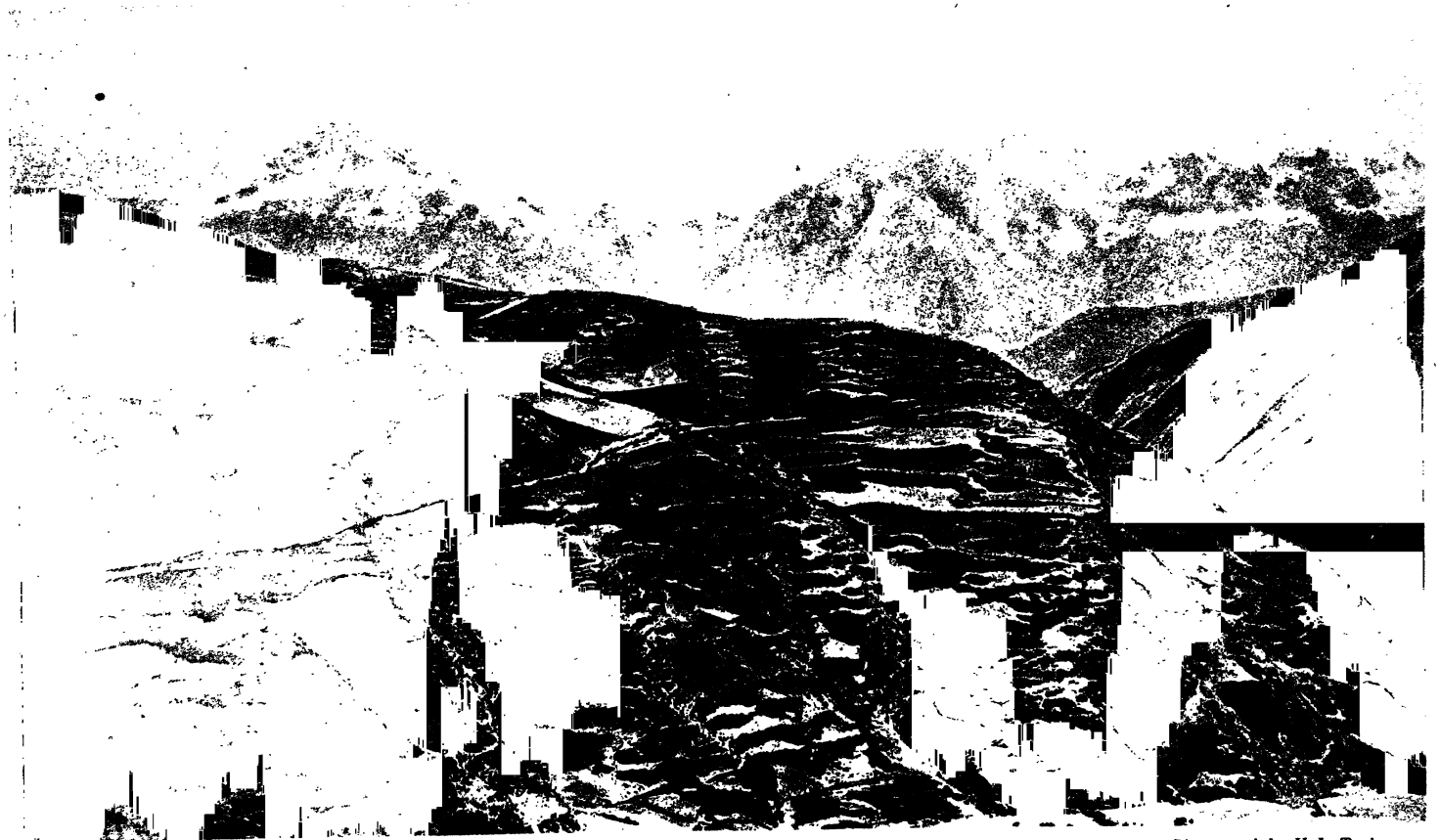
Situated on the top of the ridge at the foot of the hill called Huarua, protected on all sides by precipices and on three sides by the Urubamba River, Machu Picchu was ideally located for defense. The mountains in the distance form the side walls of the Grand Canyon of the Urubamba, often nearly a mile and a half deep.



Photograph by Hiram Bingham

THE SWITZERLAND OF PERU: A SCENE IN THE CENTRAL URUBAMBA VALLEY

The people of Pre-Columbian Peru had more than sixty species of plants under general cultivation, with half as many more under local cultivation. No other part of the Americas equaled this record. Peru was the chief center of plant domestication in the New World



Photograph by H. L. Tucker

WHEAT AND BARLEY FIELDS ON THE SLOPES ABOVE THE URUBAMBA VALLEY

Across the middle of the picture runs one of the great highways of the region that has its center in the city of Cuzco.

The culture of the Incas may be said to have resulted largely from their success in domesticating the alpaca and the llama. They were domesticated so long ago that no wild members of the species remain. Using hundreds of thousands of beasts of burden capable of carrying from fifty to one hundred pounds apiece, the Incas were able to carry out their splendid engineering and agricultural work.



Photograph by Hiram Bingham

ONE OF THE HIGHEST AGRICULTURAL CANALS IN THE WORLD

The rich bottom lands of this elevated valley were desired by the Incas for growing potatoes. Accordingly, the meandering stream was straightened and enclosed so as to prevent it from occupying any more land than was absolutely necessary. It is in the upper valley of the Pampacahuana, a tributary of the Urubamba, and is at an elevation of 12,800 feet. Potatoes are still raised on the slopes of this valley at an elevation of slightly more than 13,000 feet.



Photograph by Hiram Bingham

AN UPLAND VALLEY EXPLORED BY THE NATIONAL GEOGRAPHIC SOCIETY-YALE UNIVERSITY EXPEDITION FOR THE FIRST TIME IN 1915

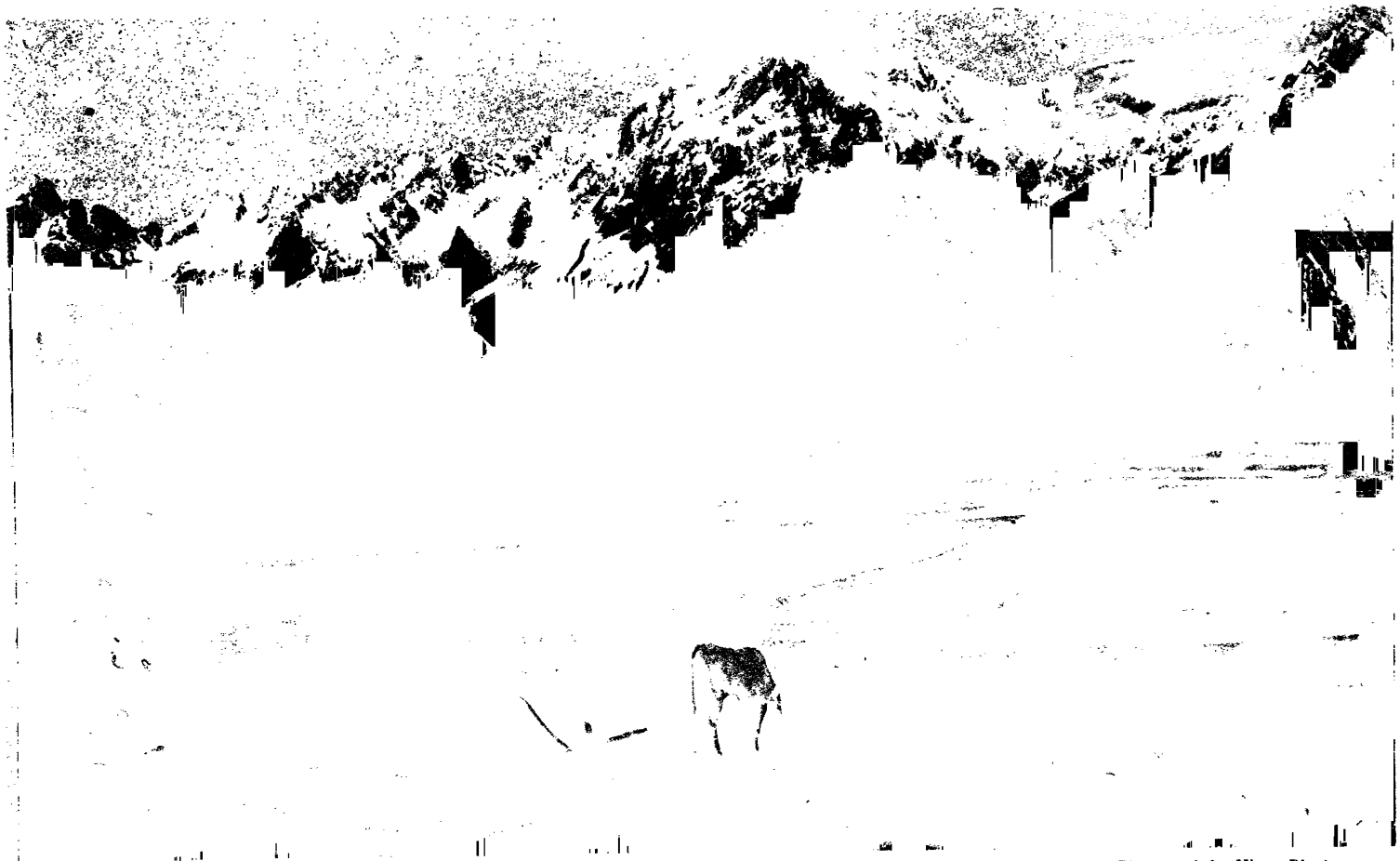
We are able to get a glimpse of life among the ancient Incas through the part of their vocabulary that has come down to us. They had different expressions to denote all the degrees of drunkenness, which shows that they had no prohibition; the absence of words for buying and selling shows that money was unknown; the fact that they had a single word to denote "enemy" and "soldiers" would indicate that they must have been "peace-at-any-price" people.



Photograph by Hiram Bingham

A ROADSIDE SCENE IN THE CENTRAL URUBAMBA VALLEY

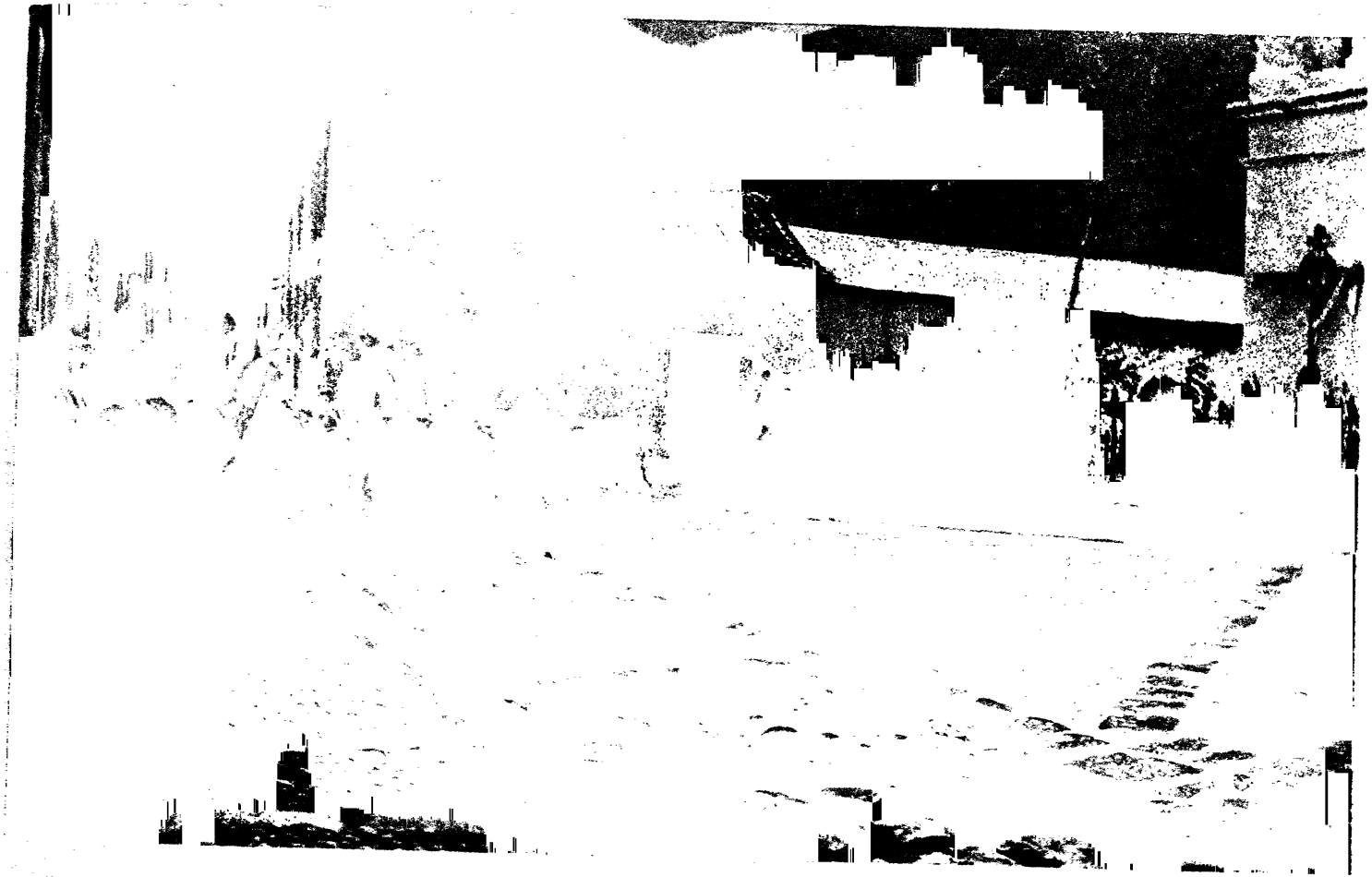
The rim of this valley is from 6,000 to 10,000 feet above the river, and from 16,000 to 20,000 feet above the level of the sea. In these remote regions a llama can be bought for three dollars, a sheep for thirty cents, and a llama-load of firewood for twenty cents.



Photograph by Hiram Bingham

PLOWING TIME IN PERU

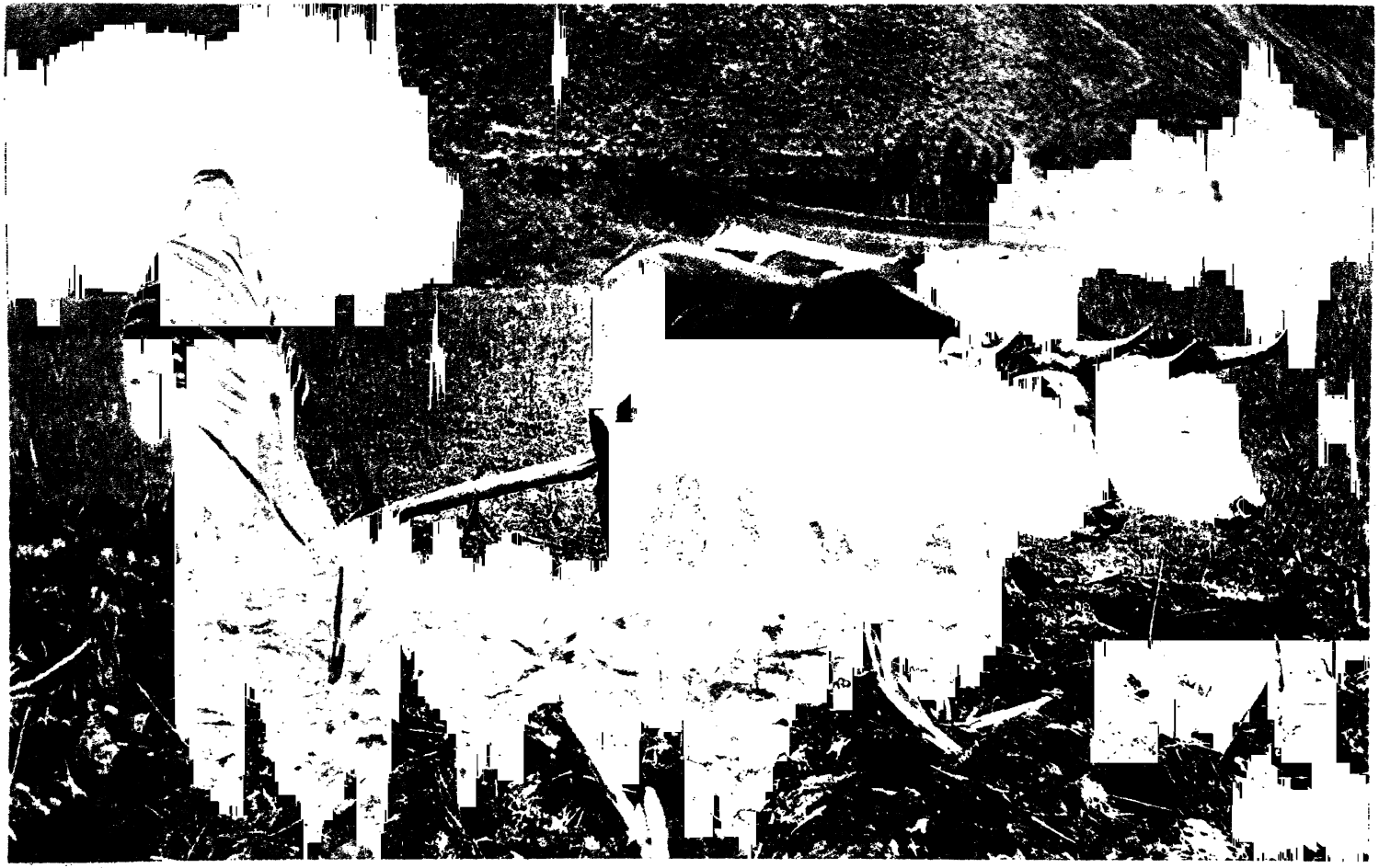
The sons and daughters of the Inca race may still survive, but their blood has outlasted their civilization.



Photograph by H. L. Tucker

A TYPICAL PERUVIAN PLAZA

The llamas are loaded with rock-salt. The open sewer in the center of the street is characteristic of most mountain towns.



Photograph by W. G. Erving

PLOWING IN THE CENTRAL ANDES

The plowman is a Peruvian mountain Indian. His oxen are descendants of the imported European stock; his plow is an iron tipped, pointed stick such as his ancestors have used since the Spanish Conquest. The scene is laid in the Urubamba Valley. The chief crop is Indian corn.



Photograph by Hiram Bingham

OUR CARAVAN CROSSING THE COASTAL DESERT AT AN ALTITUDE OF 15,000 FEET: MT. COROPUNA IN THE BACKGROUND, ELEVATION 21,703 FEET



Photograph by Hiram Bingham

A MULETEER'S STORE IN AN ARCADE ON THE GREAT PLAZA OF CUZCO

Here is exposed for sale everything that appeals to the eye and the pocketbook of the Peruvian muleteer. Richly decorated halters, leather knapsacks in which to carry his coca or other valuable articles, and even flutes to while away the weary hours of his journey are here displayed.



Photograph by Hiram Bingham

A BOY SHEPHERD AND HIS SHEEP: NEAR CHINCHEROS, PERU

As soon as they are able to walk the little Indian children of Peru are set to work. They are early taught to collect firewood and forage wherever they can. They have no toys and live a playless childhood. It is not an uncommon sight to see a little three-year-old girl driving home a sheep loaded with small branches which she herself has collected for firewood.

than the Babylonian wonder. A bank of 50 terraces 10 feet high means a vertical height of 500 feet. Many slopes have more than 50 terraces, forming huge staircases as high as the Washington Monument, resting against the lower slopes of mountains that tower for thousands of feet above. It is only by taking the ancient works out of their natural setting that we can appreciate their gigantic proportions.

AN AMAZING SPECTACLE

In the days when they were built, the hanging gardens of Peru must have presented an amazing spectacle. All of the terraced valleys, with their teeming populations, were probably as clean of trees and shrubby vegetation as some of the valleys still are, where people have continued to be too numerous to permit of reforestation. Thus the terraces must have stood out in much greater prominence than they do now, when most of them are abandoned and overgrown with grass and bushes. In some of the valleys in the vicinity of Ollantaytambo reforestation is well advanced and the terraces now support large trees.

THEIR MEMORIALS TO THE GREAT WERE AGRICULTURAL TERRACES INSTEAD OF TOMBS

The building of terraces was developed into a fine art in Peru. *The skilled labor that was lavished in ancient Egypt on the tombs of the sovereigns appears to have been applied in Peru to the construction of gardens of special workmanship for raising the food of the royal family.* The ancient Peruvians made burial structures for the mummies of their dead, but the chief concern was for the living. The tombs were of modest proportions and were placed in caves or set high on the rocky cliffs in the mountains, not in locations suitable for agricultural purposes.

Pressure of population afforded, no doubt, the underlying compulsion to go forward with the construction of the agricultural terraces, and at the same time tended to develop skill and emulation. The natural interest in the permanence of one's work, the desire to do it well, and the wish to have it appear to advantage, doubtless were motives that spurred the ambition of the prehistoric masons, as of artists of the present day. The terraces are beautiful, not only because the stones are finely dressed and nicely fitted, but because the work is fully in keeping with its surroundings and admirably adapted to its purpose. The function of a terrace wall is to stand and hold the soil. Thousands of the ancient terraces have stood through the centuries, and the soil that the ancient people laid down is still in place.

The work that the prehistoric builders accomplished is still beyond our comprehension. Nobody has explained how it was done or how it could be done. Indeed, the modern Indians deny that it ever was done, preferring to believe that it was the work of enchantment. Huge rocks that could have been moved only with the greatest difficulty and by the combined labor of hundreds of people are nevertheless fitted together with incredible nicety. To say that there are seams too fine to insert knife-edges or tissue papers leaves the story only partly told. There is no room for inserting anything, since the surfaces are actually in contact.

With some of the finest work, at Ollantaytambo, the joints are in many places too fine to be seen by the naked eye. A lens becomes necessary to make sure that there is really a seam and not merely a superficial groove, or false joint. Professor Bingham compares the fitting of the stones to the grinding of glass stoppers into bottles, which is the best analogy thus far suggested. But how can anybody credit the idea of grinding together with such accuracy the edges of stones that weigh tons? Obviously the edges must have been ground before the stones were put in place. But the grinding in itself does not seem so difficult to explain as the shaping of the stones with such accuracy that the ground edges fit so absolutely together.

THEIR MASTERPIECES WERE GARDENS INSTEAD OF FORTRESSES

That the masterpieces of the Megalithic art have been described hitherto as fortresses instead of as gardens only shows how far our own race is from appreciat-

ing the devotion of the ancient people to their agricultural pursuits. From the nature of their undertakings it is plain that in those days agriculture had the highest consideration. Nothing that human labor could accomplish was too much of an honor to be paid to the art that enabled these ancient people to create for themselves the essentials of a civilized existence, even under very unfavorable natural conditions. Notwithstanding the enormous labor expended upon the building of ordinary terraces, such work was carried far beyond the practical necessities and brought to a stage of perfection that compels us to wonder as well as to admire.

In some respects even the finest of the walls appear very rude, but for that very reason they bear the more overwhelming testimony to the remarkable perseverance of the builders. In what other way could a primitive people have left so convincing a testimony of their attainment of the condition of an ordered society? The people who carried through these undertakings had not only solved the problem of existence and of food supply, but had developed very high standards of artistic perfection, along with the energy and patience to carry them into execution under natural conditions of extreme difficulty and with none but the simplest of tools.

The development of terrace-building into a fine art would follow naturally after the terrace system of agriculture came to be widely used. No people capable of such perseverance in the building of terraces would fail to take pride in their walls, as masons have done ever since. From the very foundation of Rome we have the tradition that Romulus killed Remus in a quarrel over the construction of a wall.

In Peru the building of walls for terraces came in advance of walls for houses or towns, and we may believe that the builders of the finest terraces received the highest appreciation. Building the terraces in more difficult places and making them of harder and larger stones, joined with greater and greater skill, would be natural steps in the development of the art, like the larger and larger pyramids of the successive Egyptian pharaohs. Indeed, when all the conditions are taken into account, it is difficult to imagine any other kind of work in which skill would be so likely to be developed and applied as in the building of these terraces.

THE STRUCTURE OF THE TERRACES

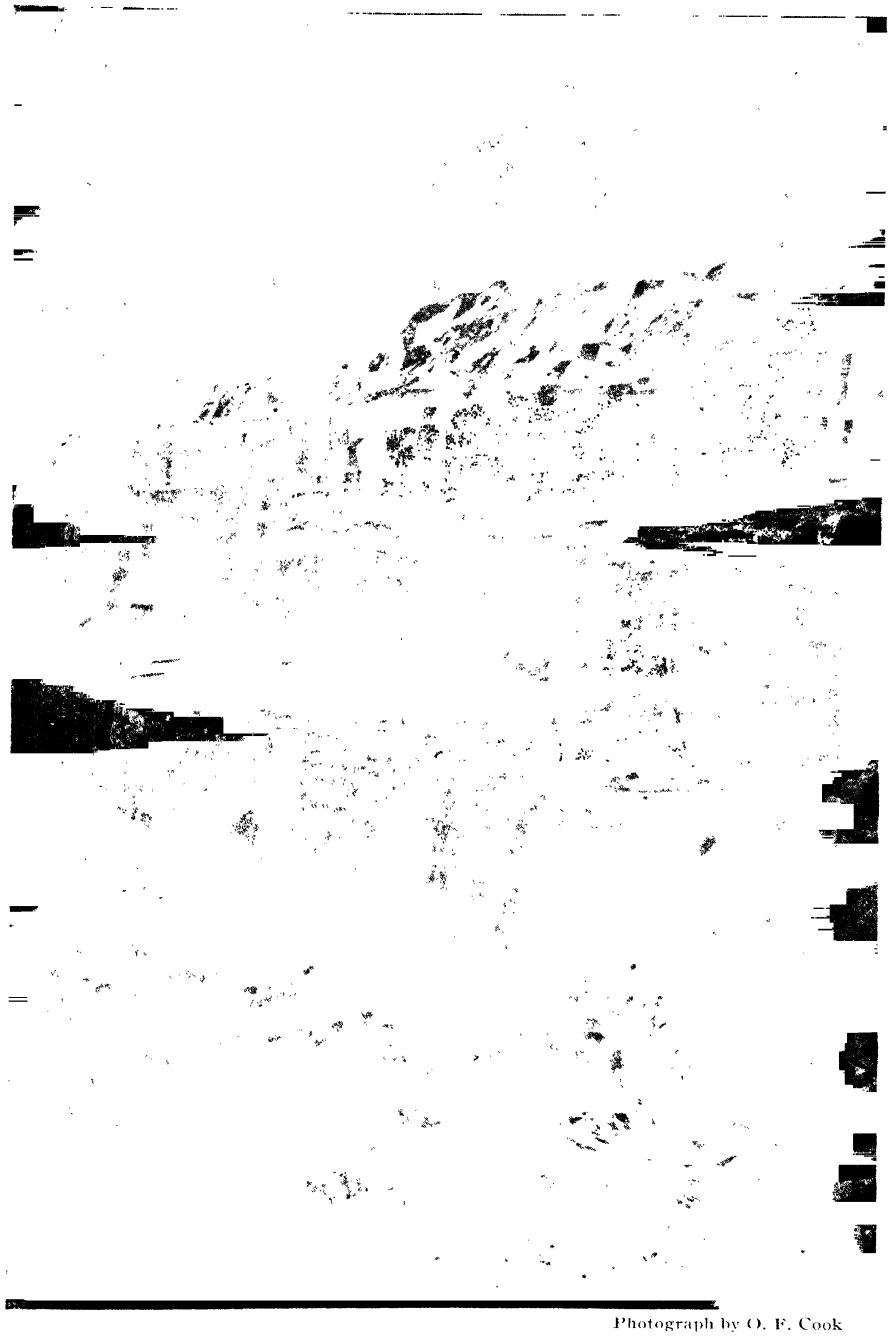
That the terraces, including those of the finest construction, were built for agricultural purposes is obvious as soon as their internal construction is taken into account. Each terrace consists, roughly speaking, of three parts—the wall and the two distinct layers of earth that fill the space behind the wall. *All of the ruined terraces show the same inside structure, wherever the walls are removed.* The strata that are hidden behind the walls are artificial no less than the stone facing (see page 509).

The underlying stratum, or artificial subsoil, is composed of coarse stones and clay, and is covered by a layer of fine surface soil two or three feet thick. The thickness of the subsoil layer depends, of course, upon the height of the terrace. Where clay or other light-colored material is used for the subsoil, the difference between the two layers appears most striking; but the finer texture of the upper layer also renders it very distinct (see page 508).

In height the terraces range usually from 8 to 14 feet, the width depending upon the slope. Terraces on very steep slopes or narrow shelves of rock are sometimes only 3 or 4 feet wide, though the usual range is from 8 to 15 feet, or still wider on the more gradual slopes. Banks of 20 to 30 terraces are not uncommon, while 50 or more are found in many cases.

That some of the stones and soil for building the terraces was carried by llamas is not impossible, but does not seem very probable. Most of the terraces are at elevations below 11,000 feet, while llamas are used chiefly in the higher altitudes. Probably most of the soil was moved in baskets or mats carried on men's backs.

There is a tradition that earth for the Inca garden at Cuzco was brought from a special place near Quito, some 700 miles



Photograph by O. F. Cook

A FEW OF THE FINEST MEGALITHIC TERRACES OF THE HANGING GARDENS OF OLLANTAYTAMBO

Some of the stones have been torn away near the corners of the terraces, and the upper layer of fine agricultural soil is partly exposed. The row of niches in the upper terrace may have corresponded to a row of windows in an outer wall, thus inclosing a long passage or corridor, with a doorway at either end, of which one remains (see page 438).

away. This may be taken at least as an indication that soil was carried sometimes for long distances, and in such cases it probably was transported on pack animals.

THE WATERING OF THE TERRACES

Water was brought to the terraces from the slopes above in artificial channels or acequias leading down, often for many miles, from the gorges of the high mountains, where they intercepted perennial streams fed by the melting of the glaciers and snow-fields (see page 504). Careful provision was made to avoid erosion of the soil or injury to the walls.

Three different methods of bringing the water down from one terrace to another are to be seen about Ollantaytambo. Some terraces have narrow vertical channels near the ends of the retaining walls. In other banks of terraces the water was brought down over large upright stones and caught in a basin below.

The third method was to carry the water down along the walls at the ends of the terraces, which were set with double rows of stones to form the water channel between.

Long banks of terraces are interrupted at intervals by passageways that doubtless served the double purpose of roads for reaching the terraces and of drainage channels to bring down surface water from the slopes above, and thus avoid the danger of having the terraces washed away by heavy rains.

The handling of the water on the terraces undoubtedly was greatly facilitated by the fact that the soils in all the terraced districts are extremely tenacious and not readily eroded. A few sods or a small ridge of earth will hold in check a stream of water, even with a swift current.

THEY PROBABLY HAD SHOWER-BATHS

A special feature in terrace watering was indicated at Machu Picchu, where many large stones, deeply grooved lengthwise, lie scattered along the terraces. Such stones might have served as spouts to carry the water out from the terrace wall, and thus avoid still further the danger of erosion or undermining of the wall.

The idea of hanging gardens watered by small streams or jets falling through the air affords an attractive possibility in the existence of the ancient people. Conducting the water down over the terraces in this way would afford ample shower-bath facilities for the people who worked on the terraces. Let us at least cherish the hope that the so-called "baths" found in the ruins of Machu Picchu and elsewhere were not merely basins where water was dipped up in jars, and that the ancient people were not as deficient in ideas of bodily cleanliness as their modern descendants. Ethnologists are familiar with the fact that the introduction of European clothes has tended in many countries to destroy habits of cleanliness among primitive peoples.

A LAND-STARVED PEOPLE ACCOMPLISH THE INCREDIBLE

Some of the most laborious terracing is not on the steep slopes, where the terraces are high-walled and narrow, but in the bottoms of the valleys, where the terraces are often very broad. The building of broad terraces required more labor because it involved the filling and leveling of much larger areas behind the walls. Much of the work could have been avoided by making larger numbers of lower and narrower terraces, but the walls would have been more numerous and would have occupied more of the surface.

With labor very abundant and land very scarce, the ancient engineers followed the plan of making the terraces as broad as possible, sometimes even to the extent of bringing material and filling in behind walls 15 or 20 feet high. Thus it would be very conservative to estimate that the building of the broad, valley-bottom terraces involved the handling and replacing of the earth for an average depth of at least 6 feet over the entire surface. This allows 3 feet for the surface layer of fine soil and at least an equal depth for the subsoil layer.

The labor would depend, of course, on how far the material had to be carried. Some of it may have been moved only a few feet, some a few yards or rods, but some must have been brought for considerable distances, as when areas of cul-



Photograph by O. F. Cook

SOME OF THE STAIRCASE FARMS OF THE ANCIENTS

Each terrace consists of three parts—the wall and the two distinct layers of earth that fill the space behind the wall. *All of the ruined terraces show the same inside structure, wherever the walls are removed.* The strata that are hidden behind the walls are artificial no less than the stone facing (see also illustrations, pages 508 and 509).

The underlying stratum, or artificial subsoil, is composed of coarse stones and clay, and is covered by a layer of fine surface soil two or three feet thick. The thickness of the subsoil layer depends, of course, upon the height of the terrace. Where clay or other light-colored material is used for the subsoil, the difference between the two layers appears most striking; but the finer texture of the upper layer also renders it very distinct. The lower terraces of this bank are still under cultivation. In the background a part of the megalithic terraces can be seen. A ruined Inca house stands near the base of the precipice at the left.

tivated lands were widened by building new terraces along the beds of the streams.

In many cases the work was evidently planned so that large immovable boulders or outcrops of rock could be utilized in the building of the walls instead of being allowed to diminish the area of cultivated land. We may believe that powder or dynamite, to shatter refractory rocks, would have been very highly appreciated among the ancient Peruvians.

STRAIGHTENING OF RIVER BANKS AND STREAM BEDS

It would be a mistake to suppose that reclamation work in the bottoms of the valleys was wholly or even principally of the nature of improving irregular land by terracing and leveling behind the walls. A large part of the surface of the valley bottoms must have been altogether bare of soil, as the unimproved portions still are—mere wastes of loose stones brought down by the torrential floods.

The natural behavior of swift mountain streams is to cut irregular channels back and forth between the walls of their valleys, but in the terraced valleys of Peru it is the regular condition to find the rivers and smaller streams confined to channels of definite width, and sometimes kept in straight courses for several miles at a stretch, as in the case of the Urubamba River near Pisac, and again below Ollantaytambo. In the latter instance the river runs for nearly five miles in a straight course, and, although the ancient walls that were built to confine the river have remained intact in only a few places, the artificial nature of the channel is obvious.

A road that runs along the river has utilized the top of a buried wall as a pavement. These buried walls, which occur also in other places, make it evident that narrowing of the channel of the river was accomplished by gradual stages. In this case the area of cultivated land was widened for about 12 feet toward the river by building a new wall closer to the river and filling in behind it. The old wall was left in place, but buried in the mass of the terrace and covered with earth so that it did not interfere with the cultivation of the land. Thus the land-starved people gained an additional strip of land, only a few feet wide, but several miles long. The river may have furnished the stones for the new wall, but the layer of surface soil must have been brought from a distance.

THESE ANCIENT PERUVIANS BUILT AQUEDUCTS THAT ARE UNEQUALED ELSEWHERE

The ancient aqueducts of Peru have challenged the most attention from former travelers, and they do not become less worthy of admiration because they are now seen to be only one feature of a highly specialized agricultural system. The construction of the irrigation channels was an enormous undertaking, perhaps not equaled in any other part of the world. From the aqueducts alone it is evident that agriculture must have attained a high development, which may explain why the other branches of the art have received less consideration.

How numerous and extensive the ancient aqueducts really were may never be known, but the subject is worthy of much more extensive study than it has received thus far. If the accounts of early Spanish writers are to be accepted, some of these aqueducts were very long. Garcilasso wrote of one of them as 55 leagues long and another 120 leagues, with a depth of 12 feet.

Where the soil was loose the channels were paved with stones for many miles. On rocky slopes or precipices channels were cut into the cliffs, and in some cases tunnels of considerable length are said to have been drilled.

Where channels were being carried along the sides of steep slopes, the usual method of passing vertical surfaces or overhanging rocks was to build up a wall from below to the height of the channel. In sheltered angles such walls remain in place after the channels that ran along the exposed slopes have entirely disappeared.

WHERE SQUASHES ARE TIED

The favorite courses for the ancient irrigation channels, and by far the best from an engineering point of view, were along the very crests of the ridges and spurs of the mountains. In such places the water-courses were cut, and now have worn deep grooves. Thus there is no danger of the channels washing away or being filled up by drainage from above, as with channels that run along the slopes (see page 517).

Cultivation was by no means confined to the walled terraces that usually follow the lower slopes of the mountains, but was carried all the way up, on any slopes that were not too steep to permit the accumulation of soil. It was not necessary to build terraces to get rid of rocks on slopes that are so steep that rocks roll off. Slopes are even now cultivated where squashes have to be staked or tied to keep them from rolling down the mountain, and where potatoes must be picked instead of being shaken from the vines. As these higher slopes are cool and cloudy, there is much less need of irrigation than in the valleys below.

Though stone terraces were seldom built on the high slopes, a system of narrow earth terraces or transverse ridges, somewhat analogous to the contour farming in our Southeastern States, was in general use. Remains of such ridges cover large areas of the higher slopes. Usually there are a few large ridges at intervals, with numerous smaller ridges between. Many of these smaller ridges can be seen from the valleys below only when the light comes from a particular angle, so as to cast shadows across them. When lighted from in front the inequalities are not shown, and nobody would suspect that such steep slopes, now producing only a sparse and scattered



Photograph by O. F. Cook

TERRACES ON NARROW SHELVES

In addition to the terraces of regular form built in banks, any irregular shelf of rock that would support a wall was likely to be used as an agricultural terrace. In this case the shelves were so narrow that the terraces could have been only three or four feet wide—hardly room enough for more than one row of potatoes.

growth of bunch grass, were once cultivated (see illustration, page 511).

In one place just below Urcos a narrow strip between broken precipitous rocks is covered with short transverse ridges like a stairway.

The areas that have been farmed in this way are very extensive, much more so than the lands that are still cultivated in the valleys below. A few of these high slopes are still cultivated, but most of them have been abandoned. Where the lands are now used by the Indians, the same system of transverse ridges is employed. The larger ridges at intervals have the effect of preventing, or at least impeding, erosion. These ridges are not cultivated, but are left in grass, and thus serve to let the water run down the slopes without allowing it to cut channels, thereby having the function of spillways or "drops" in irrigation systems.

EVEN THE GLACIERS RETREATED BEFORE THEIR INDUSTRY

Riding for many hours, or even for days, through valleys where all of the upper slopes show signs of having been cultivated in former times, and very few are cultivated now, eventually gives one an almost oppressive feeling of the past that has vanished long since, and yet is so ever-present that the eye can scarcely avoid it, even when one looks up to the glaciers and the eternal snows. The people who grew potatoes on the high slopes must have stood in their day against the same icy background. Indeed, their agricultural activities may have driven the very glaciers back, by gradually clearing the mountain slopes and exposing them to the sun, just as they narrowed and straightened the river torrents by hemming them in with successive walls of rock.

That the glaciers formerly extended much farther down is shown by the positions of the moraines. There can be little doubt that the whole aspect of the country has been altered profoundly during the very long period of intensive agricultural occupation. Biologically speaking, there is every reason to believe that most of the cultivated lands had a forest covering originally, and that the present state of denudation is largely artificial. Remnants of a native forest flora are still to be found in places too rocky and broken to be cultivated, even by the strenuous methods of the ancients.*

A RECLAMATION AGRICULTURE

From the facts already stated, it is apparent that the ancient agriculture of the interior valleys of Peru was to a very large extent a reclamation agriculture—that is, an agriculture involving community organization and planning in advance. Only a very small part of the land that was used was naturally adapted to the raising of crops. Much of it was too dry to grow crops without irrigation, and even more of it was so steep or so rocky that the surface had to be terraced or otherwise reformed in order to make it suitable for cultivation.

Of the four forms of reclamation that were so extensively employed in ancient Peru not one has been used, or even seriously considered, in the United States. Nowhere do we cultivate steep lands like the higher slopes of the Peruvian valleys, or build stone walls to support narrow terraces, or place artificial soil on broad terraces in valley bottoms. In a few places we are beginning to straighten and confine our rivers to make more land along the banks, but chiefly with the object of preventing floods or reclaiming broad, level lands by drainage, not with the idea of building new lands in the rocky beds of torrents, as in Peru.

COÖPERATION FOR THE COMMON GOOD

Primitive the ancient Peruvians were in many ways, as their modern Quichua descendants still are; but with respect to agriculture and some of the attendant arts a very high state of development must have been attained and at a remote period. Otherwise it would have been impossible to occupy and reclaim many of the places that evidently were centers of population in ancient times.

Many localities must have been treated as reclamation projects from the very

* For a more detailed treatment of these matters, see "Agriculture and Native Vegetation in Peru". Journal of the Washington Academy of Sciences, Vol. VI, pp. 284-293.



Photograph by O. F. Cook

WHERE THE CROPS OF THE INCAS WERE STORED

Storehouses represent a very specialized branch of Inca architecture. A long, narrow building, with one wall much higher than the other and a curious half-gable roof tied to projecting stones, typifies this kind of structure. The width of these storehouses inside the walls is usually less than eight feet, and many of them are built in small sections, which are nearly square. The one shown in this photograph was about 28 feet long and 25 feet high. The walls are about 30 inches thick, of stones laid in clay and stuccoed with clay mixed with grass. The unusual height of the building, the arrangement of the windows, and the lack of any indication of an upper floor argue against its use for human habitation. It is far more likely that this type of house was built for the specific purpose of a granary or storehouse.



Photograph by O. F. Cook

TERRACED VALLEY BOTTOM AT OLLANTAYTAMBO

All the open fields are broad, artificial terraces. A large aqueduct or causeway, about a mile long, carried on walls 15 to 30 feet high, seen in the middle of the picture, crosses the valley in a nearly straight line. A part of the town is seen in this view from the northern bank of elevated terraces or hanging gardens. In the lower right-hand corner is the end of the projecting ridge that carries the hanging gardens. The town is surrounded on three sides by large agricultural terraces (see pages 438 and 440). The valley at this point is about a mile broad and overhung by steep mountains about a mile high. Several banks of terraces, their true size dwarfed by the mountain above, can be made out along the base of the rocky slope. This view is from the slope above the hanging gardens.

first. They could not have been occupied in any desultory way by colonists or settlers acting separately as individuals. This is plain from the natural conditions and from the nature of the work that had to be done before the crops could be grown to support the colonists.

In many places the aqueducts afford the only permanent supplies of water for human uses as well as for the irrigation of crops. Deliberate planning is also shown in the placing of the aqueducts and terraces, and in the regular way in which the lands of the ancient reclamation enterprises were laid out. Large areas appear to have been developed as units, on the basis of carefully considered undertakings. If the valleys had been settled first by unorganized individuals, at liberty to take lands where they liked, the most favorable places, where the lands were nearly level, would have been occupied first. The tendency would have been to pile up the stones around the boundaries of the fields, which would take the form of irregular circles or fans, like those that occur in some localities.

An excellent example of the results that naturally would follow from a desultory occupation was observed in the Urubamba Valley, near Calca, in a district where crops can be grown without irrigation. The contrasting conditions are represented by the district around Ollantaytambo, where evidences of regular planning are encountered on every hand. The regular planning of the ancient Peruvian cities has been remarked by Wiener, who gives the plan of Ollantaytambo as an example; but the regularity in the laying out of the lands and irrigation works affords still better evidence that the plan was made before the district was occupied. A town site might be changed or reorganized by a powerful chief, but it would be more difficult to believe that all of the agricultural lands would have been readjusted if they had been occupied at first in a desultory manner. In the Peruvian system *the agricultural structures are more permanent than the dwellings.*

In relation to agriculture the results of archeological research in the two hemispheres present a striking contrast. In the Eastern Hemisphere the general result is to show that the civilizations supposed to be the most ancient are not really primitive or aboriginal. They did not have their beginnings and early development in Egypt or Mesopotamia, but were brought from elsewhere. The early dynastic Egyptians came into the Nile Valley from the East and the early Babylonians into the valley of the Euphrates from the South. Nor does it appear that either of these alluvial valleys afforded natural conditions that were really favorable to the practice of agriculture by a very primitive people, nor types of plants suited to domestication.

A MOST INTERESTING COMPARISON

The crop plants as well as the ancient agriculturists came into the valleys as a result of colonization. In other words, the valleys were developed as reclamation projects by peoples already skilled in agricultural arts and with an established social organization.

Where these civilized colonists came from is still a question. They are supposed to have come into Egypt and Mesopotamia from southern Arabia and to have been a maritime people, as well as agricultural; but they have not been traced back to their original home or to the place where their agriculture and other arts were developed.

The study of agriculture in America has led to directly opposite results. The older idea that the primitive civilizations of Mexico and Peru were originated by colonists from China, the Malay region, or the East Indies has gradually given way to a belief among archæologists and ethnologists that the primitive civilizations of America were developed entirely on the American continent. Certainly this appears to be true of the art of agriculture. All of the economic plants on which the ancient American agriculture was based are now believed to be of American origin, and a very large proportion of them appear to have come from South America, and especially from the region of Peru.

Of course, it would not follow that agriculture might not have originated in other places as well as in Peru. All that



Photograph by O. F. Cook

ANCIENT AQUEDUCT AND TERRACES

A portion of the long walls crossing the Urubamba Valley at Ollantaytambo, shown in the general view on page 502

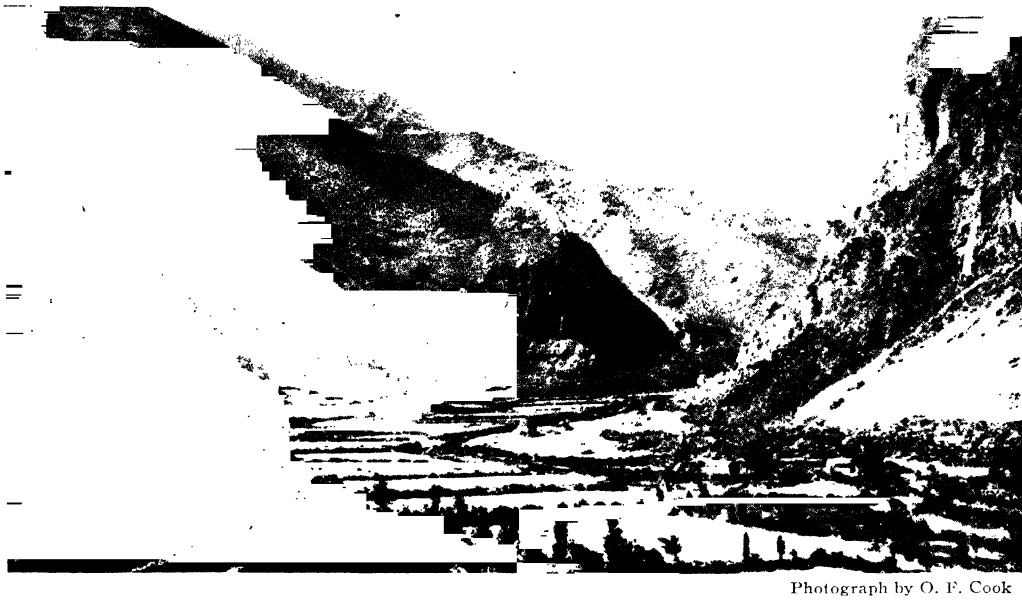
can be said now is that the indications of such a center of origin and domestication of plants in other parts of the world are less definite than in the region of Peru.

It may be that the deep, narrow valleys of Peru imposed conditions necessary to the development of agriculture, at least in its very early stages. The difficulties of communication would mean that each valley must have had its own group of people, separate from all of the others, and that each of these independent communities was restricted to a narrow range, with only a limited stock of natural products to draw upon, and hence under pressure to learn how to increase the growth of the useful plants and destroy their useless competitors.

Whatever the motive or the pressure that led to the development of agriculture under such conditions, of the fact there can be no doubt. That the system of agriculture did develop here is proved by the fact that the plants on which the agriculture was based were indigenous, and that no such system existed in other parts of America.

YOU CAN LOOK FROM THE EQUATOR TO THE POLES

Agriculture in Peru is a matter of altitude. Geographically you are in the tropics, but agriculturally you may be anywhere between the Equator and the northern limit of agriculture, at the Arctic Circle. Moreover, you can find this



Photograph by O. F. Cook

A TERRACED VALLEY ABOVE OLLANTAYTAMBO

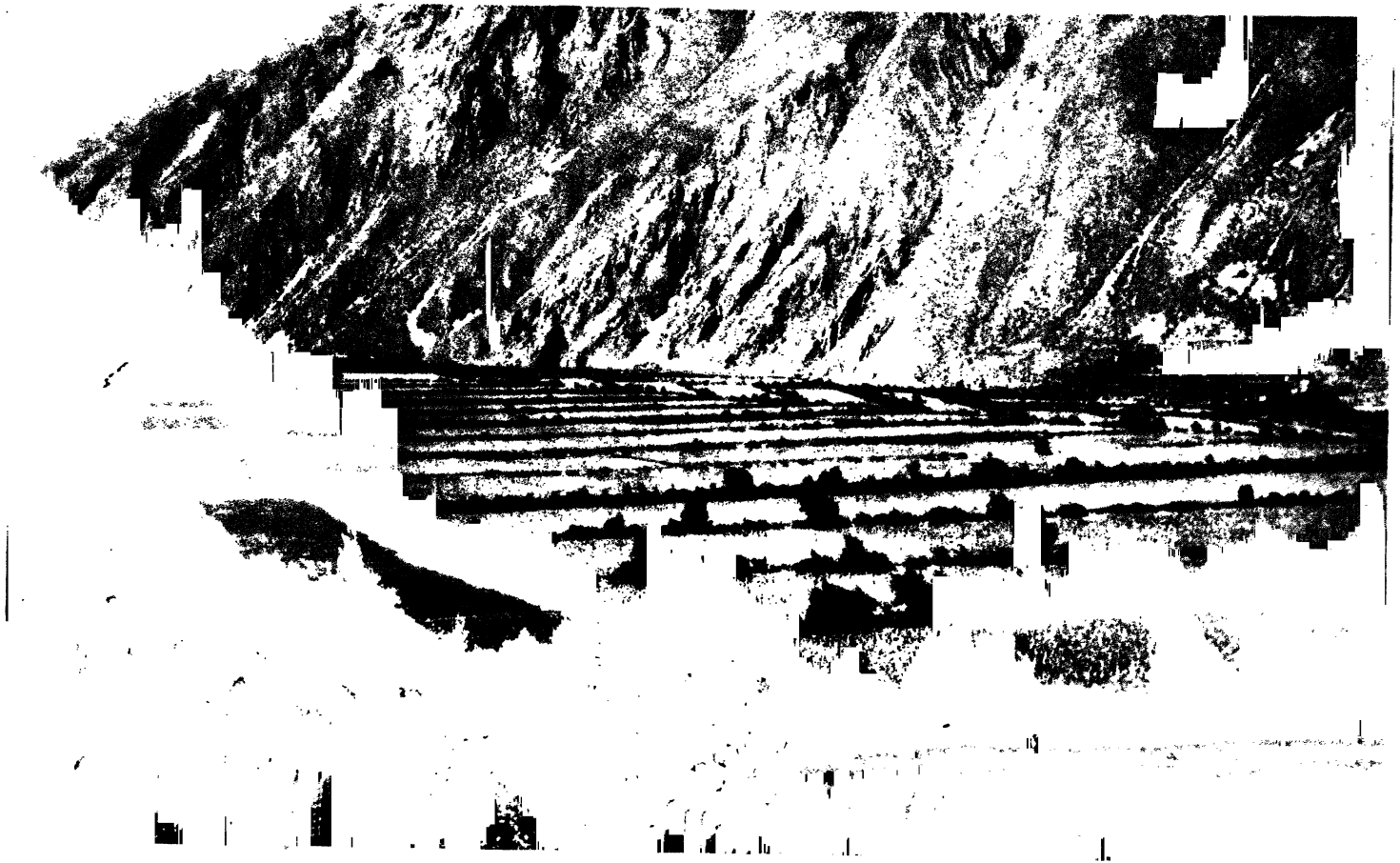
The terracing of this narrow valley is amazing. Parts of it are shown in several photographs that follow (pages 506 to 518). The high slopes at the left were also cultivated in former times. At the base of the steep mountain on the right is a large slide of loose stones, several hundred feet high. All this flat valley is artificial—that is, it was a gully—and would so have remained if the Peruvians had not broadened it and leveled it out (see text, page 496).

range of conditions, not by going to different parts of the country, but in different parts of the same valley, in places within plain sight of each other. Thus from among the plantations of sugar, coca, or cacao, at Santa Ana one can see at the other end of the valley some of the peaks of the Cordillera, covered with glaciers and perpetual snow. It is like looking from Jamaica to Alaska. Even on foot or on mule-back only a few hours are required to climb up or to descend through the full range of agricultural possibilities.

No very definite division into agricultural belts is possible. Some crops are confined to the high altitudes and others to the low, but there is endless overlapping with the intermediate crops. Three agricultural belts can be distinguished on the basis of the principal food plants. The cultivation of cassava, called *yuca* in Spanish and *rumu* in Quichua, may be allowed to characterize the lowest or tropical belt, which extends in the Urubamba Valley to an altitude of about 6,000 feet. From this altitude to about ,000 feet is the intermediate belt, with maize as the principal native crop, while in the Andine belt, above 11,000 feet, the potato is the most important food plant.

In some districts wheat is grown rather extensively and is often the chief crop at altitudes between 10,000 and 12,000 feet. Barley and broad beans (*habas*) are two other European crops that are planted on a relatively large scale at high elevations. Above 12,000 feet the people are engaged chiefly with the grazing of herds of llamas, alpacas, cattle, and sheep; but potatoes and other Andine crops are planted on a small scale for the support of the pastoral population. In most places agriculture does not go much above 13,000 feet, but on some of the slopes above the Pass of La Raya potatoes are planted at altitudes above 14,000 feet. The vines make normal development and produce abundantly when planted in good soil.

Even among people of intelligence and interest in agricultural problems the superficial fact that Peru lies within the tropical zone is commonly allowed to obscure the relation of its agriculture to that of temperate regions. The fact is, of course, that in spite of the proximity



Photograph by O. F. Cook

A RECLAMATION PROJECT MADE IN PERU WHEN THE EUROPEANS PROBABLY LIVED IN CAVES

Immediately below Ollantaytambo are these broad terraces, covering more than a square mile. The soil in these terraces was assembled and put in place as carefully as for the terraces shown on page 497 (see text, page 499). The land produces a crop every year and probably has done so for centuries. In the background along the slope at the left may be seen an inclined road, where the ancient people dragged up the enormous stones to the top of the ridge above the hanging gardens shown in previous photographs.

to the Equator large areas of the plateau regions of Peru have not merely temperate climates, but conditions that could be more correctly described as cold temperate, subarctic, or alpine.

THE LESSON OF THE POTATO

In spite of having come from intertropical South America, the potato does not endure heat, but thrives at the extreme limit of agriculture in the Northern Hemisphere—Norway, Finland, Siberia, Alaska, and Newfoundland. Likewise in the Southern Hemisphere the potato was carried, even in pre-Spanish times, to the cold coast belt of Peru and Chili, and has since been taken to South Africa, Tasmania, and New Zealand (see also pages 510 and 513).

The wide utilization of the potato has proved strikingly that a plant able to grow on the high plateaus of Peru may be adapted to any of the coldest regions where agriculture is practiced in other parts of the globe, and indicates that the other domesticated plants of Peru may also be useful to all the temperate and subarctic regions of the world.

MORE PLANTS WERE DOMESTICATED IN PERU THAN IN ANY OTHER PART OF THE WORLD

It was fortunate for the rest of the world that the ancient Peruvians practiced agriculture under so wide a range of natural conditions, since this led to the domestication of a large series of crop plants. More plants appear to have been domesticated in the Peruvian region than in any other part of America. A large proportion of the cultivated species were limited to this part of the world, so that no question can be raised of their having been brought from other regions. Other kinds of crop plants used by the ancient Peruvians were widely distributed in ancient America, more especially the tropical species, those that are grown at low elevations. If these also originated in Peru, that region was responsible for by far the larger part of the American series of crop plants, more than all other parts of America taken together.

Among the more important crop plants that were cultivated by the ancient Peruvians were maize, or Indian corn, potato, sweet potato, and cassava. The following partial list of the Peruvian crop plants may give an idea of the extent and variety of domestications that were accomplished in Peru:

Achupalla (pineapple), *añu* (Tropæolum), *apichu* (sweet potato), *apincoya* (granadilla), *arracacha* (Arracacia), *chirimoya, chui* (bean), *coca* (Erythroxylum), *cumara* (sweet potato), *inchis* (peanut), *oca* (Oxalis), *pallar* (Lima bean), *papa* (potato), *papaya, poro* (bottle-gourd), *purutu* (frejol), *quinoa* (Chenopodium), *rocoto* (Capsicum), *rumu* (Manihot), *sahuinto* (guava), *sara* (maize), *tintin* (Tacsonia), *tomate* (Lycopersicum and Cyphomandra), *tumbo* (Tacsonia), *ullucu* (Ullucus), *uncucha* (Xanthosoma), *utcu* (cotton).

VARIETIES OF PERUVIAN CORN

A complete list of the plants that were cultivated by the ancient Peruvians has yet to be made, but it will probably include between 70 and 80 species. A large part are root crops, vegetables, and fruits, but some are seed crops, pot herbs, condiments, medicinal plants, dyes, and ornamentals. Annual plants predominate in numbers and importance, but perennials, shrubs, and trees are also well represented.

Maize, or Indian corn, is a remarkable plant, botanically as well as agriculturally. It is entirely unlike any other crop and has very few relatives in the plant world. The early explorers found corn in general cultivation in all of the agricultural areas of North and South America, but no wild form has been discovered. Where maize originated is still a question. Some writers have favored Mexico and others Peru. The relative importance of maize was greater, no doubt, in Mexico, where not so many other plants were cultivated as in Peru. Another reason for associating maize with Mexico is the occurrence of the grass called teosinte, which crosses readily with maize and was formerly believed to represent the ancestral form.

That the cultivation of corn goes very far back in Peru is indicated not only by the abundance of specimens found in the



Photograph by O. F. Cook

A CROSS-SECTION OF A TERRACE

This part of a ruined terrace shows how the gardens were constructed. At this point the retaining wall had been carried away, except a little at the lower left-hand corner, thus exposing the material behind the wall and allowing its arrangement to be seen. Two distinct strata are apparent, coarse stones and clay below, with fine agricultural soil above.

ancient graves, but by the fact that the type of maize that furnishes the bulk of the Peruvian crop is peculiar to that region. The question is not merely of varieties, which are very numerous in both continents, but of a whole series of varieties very unlike any that are known from Central America or Mexico.

This Peruvian maize, or Cuzco corn, as it has been called in the United States, is characterized by the very large kernels, some of them nearly an inch broad, almost the size of chestnuts. The large kernels are an advantage from the standpoint of the natives of Peru, who are accustomed to eating corn a kernel at a time. The usual method of cooking corn, and everything else in Peru, is by boiling, the reason being probably that more fuel would be required for roasting or parching. Fuel is very scarce and expensive in all of the populous districts of Peru.

PERUVIAN CORN MAY HELP US

In the United States the large kernels would be of less importance, but the Peruvian type of maize may prove interesting in another way. The fact that the Cuzco corn is the only type grown extensively on the high slopes and tablelands may mean that it is more suited to cool climates than other sorts of maize. The large kernels have attracted the attention of travelers, and numerous attempts have been made to introduce the Cuzco corn into the United States. Bayard Taylor raised a few plants in Pennsylvania as far back as 1865 from seeds brought home by Squier, the well-known writer on Peru.* Such experiments with the Cuzco corn in the United States have given a completely misleading impression regarding the habits of the plant.

The usual behavior of the Cuzco corn in the United States is to produce plants of enormous size that mature very little seed, often none at all. It has been taken for granted that the size of the plants should be in proportion to the enormous kernels, and that our seasons were not long enough to permit this type of corn to mature.

But in Peru one does not see these gigantic, infertile plants, nor any indication that the corn crop requires a large amount of heat to bring it to maturity. The impression one gets from the Peruvian corn-fields is that the plants are not taller than with us and rather more slender, the most striking peculiarity being the prevailing red color of the foliage. The best development and largest ears of the Cuzco corn are found in some of the higher valleys, at elevations between 9,000 and 11,000 feet, in districts where the summer climate is cooler than in any of the corn-growing regions of the United States.

Thus it becomes apparent that the possibility of utilizing the Cuzco type of corn in the United States is still practically un-

**American Agriculturist*, 40: 9, January, 1881.



Photograph by O. F. Cook

ANOTHER ILLUSTRATION TO SHOW THAT THE SOIL AND SUBSOIL OF THE TERRACES WERE PLACED AS LABORIOUSLY AND CAREFULLY AS THE WALL ITSELF

The structure of a large agricultural terrace exposed along the stream near the middle of the valley, seen in the photograph on page 506, shows that these broad terraces are as truly artificial as the narrow ones on the slopes. A part of the old retaining wall that protected the terrace from the stream is still in place at the right, while the naked bank at the left has the same arrangement of fine soil above and loose stones for subsoil as the narrow terraces of the hanging gardens (see text, page 496).

tried, because of our lack of information regarding the normal behavior of the plant and the natural conditions to which it is adapted. As might have been expected, if these facts had been known, the best results thus far obtained from the Cuzco corn in the United States have been in California, in the cool climate of the coast districts, where there is too little heat for our eastern varieties to thrive.

Thus the first step in determining the possibilities of acclimatizing and adapting South American varieties of corn to use in the United States is to place them under conditions where the plants can behave in a normal manner and mature seed. In experiments conducted last year near the coast of southern California all of the varieties from Peru and other table-land regions of tropical America were able to mature seeds, which many of them had failed to do when planted in the Eastern and Southern States.

A CORN THAT GROWS AT AN ELEVATION OF 13,000 FEET

The cultivation of corn in a cool climate has been pushed to an extreme limit on the high plateaus around Lake Titicaca, where a dwarf form of corn is planted at an elevation of nearly 13,000 feet. The specialized nature of this variety became apparent in the experiments near San Diego, where it matured in less time than any other, or in about 60 days. Worthless as it would appear from the insignificant nubbins that we purchased from the Indian women in the market of Copacabana (page 523), this dwarf table-land form is distinctly of interest as an example of a variety with much lower heat requirements than those we now

have, which shows a possibility of extending the range of the corn crop in the United States.

In the tropical portions of the lower valleys of the eastern Andes the Cuzco type of maize gives place to another with larger ears and smaller kernels, much more similar to the Mexican and Central American varieties, or to those that are cultivated in the United States. If maize originated in the Peruvian region, it would be easy to understand that the varieties grown at the lower elevations would be much more likely to spread to North America than the varieties that are confined to the cool table-lands.

The existence of the specialized high altitude types of maize in Peru may be taken to indicate either a very long period of adaptation to the high altitudes or a possible origin of maize as a high-altitude plant. Whether the course of adaptation has been upward or downward, the success of the process is very significant of the possibilities of much wider utilization of maize in cool regions than has been considered possible in the past.

Maize is not a staple crop at very high altitudes. Above 12,000 feet it is raised in only a few places, not as a regular food, but rather as a luxury for making the native beer, or *chicha*. To take the place of maize, the natives of the elevated districts use plants that are closely related to one of our common weeds, called "pigweed" or "lamb's-quarters."

PIGWEEDS FOR OATMEAL

Two species of pigweeds are regularly grown in the valleys that lead up to the Pass of La Raya, between Cuzco and Lake Titicaca. The large species, which often attains a height of 3 or 4 feet, is called *quinoa*, while the small species, seldom more than a foot high and often only 5 or 6 inches, is called *cañihua*. In general appearance both species are much like our pigweed, but they are regularly planted and harvested by the Peruvians, and are in fact the only seed crops grown in the elevated districts that are too cold for maize.

Considering *quinoa* as a high-altitude substitute for maize means that it is valued chiefly for making beer, and in some districts most of the crop is used in this way. Only the white-seeded variety of *quinoa* is considered suitable for eating, the others being very bitter, so that they have to be boiled, with several changes of water, in order to be made palatable. The white *quinoa* makes an excellent breakfast food, fairly comparable with oatmeal, and likely to be preferred by many, both for the taste and texture. The seeds become soft with cooking, but retain their form, and do not appear so slimy as oatmeal when treated in a similar manner. The leaves of *quinoa* are also cooked and eaten as a pot-herb.

The other pigweed crop, *cañihua*, is raised altogether for food. The seeds are much smaller than those of *quinoa* and of a grayish color in the mass. They are parched slightly and ground into a fine flour. The chief use of *cañihua* is as a travel ration for the shepherds who go out on the high plateaus with their flocks of llamas, alpacas, and sheep.

THE TREASURE OF THE INCAS

The gold of the Indies was the attraction that led Columbus to sail westward, that carried Cortez to Mexico and Pizarro to Peru. The Incas had large stores of the precious metal, representing, no doubt, the accumulations of many centuries. The capture of such a booty resounded through Europe. Spain became for a time the wealthiest, as well as the most powerful, nation of Europe, and this was ascribed to the gold of Peru.

But Peru held another treasure much more valuable for the nations of Europe than the golden booty of Pizarro. Carrying the potato to Europe was an event of much more profound significance in relation to the subsequent history of the world than sending the Inca gold to the coffers of Spain. But nobody understood the value of the potato, and its Peruvian origin was generally forgotten before the plant became well known. Instead of Peruvian potatoes, we call them Irish potatoes.

The potato was the basis of the ancient Peruvian nation and has attained almost the same importance in other parts of the world within the last hundred years.



Photograph by O. F. Cook

TERRACES REACHING ALMOST TO THE SNOW

Not only the terraces, but all of the higher slopes, appear to have raised crops in ancient times, and cultivation continues in a few places that can be distinguished near the top of the ridge. The broken slope near the middle of the photograph is on the side of a deep ravine filled with a dense forest, which is spreading gradually over the neighboring slopes (see page 500).



Photograph by O. F. Cook

THE URUBAMBA RIVER OPPOSITE OLLANTAYTAMBO

An ancient retaining wall still protects a bank of terraces along the base of the steep southern slope of the valley. The terraces are overgrown with tara trees (*Cæsalpinia pectinata*), pinco pinco (*Ephedra*), chuchao (*Fourcroya*), and several species of cacti.

The instinctive prejudice against new food plants prevented any general utilization of the potato in Europe for over two centuries, and it did not begin to be grown as a crop until the period of the French Revolution. Even then it had to be forced on the public by the persistent efforts of the French philanthropist, Parmentier, who demonstrated its food possibilities by establishing a large number of soup kitchens for the poor of Paris. Potato soup still bears the name Parmentier—a homely memorial, but one that might not be ungrateful to a philanthropist.

Historically speaking, the general utilization of the potato is still relatively recent. Less than a century ago it was still considered as something of a novelty among the farmers of the United States. Thus, in 1856, we find in the *American Agriculturist* the following statement:

"I have worked a farm over fifty years, and have cultivated potatoes more or less every year. Fifty years ago little was thought of this root. A row or two were planted on the outside of corn-fields, or in some corner of a lot unfit for anything else. Ten to fifteen bushels was an ample supply for a family. There is a great difference between then and now as regards this crop, for potatoes are now one of the most important branches of agriculture" (Vol. 15, p. 256).

Contrast with this statement the fact that about 400,000,000 bushels of potatoes are produced annually in the United States. The world's crop of potatoes must be more than 6,000,000,000 bushels. The statistics of production for 1912 showed 5,931,493,000 bushels, but included no returns for the ancient centers of production in the table-land regions of Peru, Bolivia, Ecuador, Colombia, and Venezuela, nor for Central America or Mexico. As the potato-growing districts are the chief centers of population in all these countries, many millions of bushels must be produced by them.

The world total of six billion bushels means that if the potato crop of the world were to be divided equally, there would be enough to give each inhabitant of the earth about four bushels of potatoes. *The value of a single potato crop probably much exceeds that of all the gold that the conquerors took from the Incas.*

THE HOME OF THE POTATO CAN GIVE US OTHER VALUABLE FOODS

As the home of the potato, Peru may be looked upon as the source or fountain head from which must come new stocks to strengthen and maintain the varieties of this great food staple. Just as continued importation of live-stock breeds is necessary to renew our American strains, it is now beginning to be urged that new and vigorous varieties of potatoes be found to offset the gradually waning virility of old and run-out stocks.

Other possibilities lie in the direction of securing varieties that are really superior to any that we now have. Notwithstanding the enormous importance that has been attained by the potato in the agriculture of Europe and the United States, no adequate attempt has been made to secure the best forms for our use.

Peru has many kinds of potatoes superior in quality to those that we cultivate, but most of them would not be considered promising with us, because the tubers would be hard to peel on account of irregular form and very deep eyes (page 524). Breeders of potato varieties have been influenced very largely by the size and form of the tubers, with quality and flavor left largely out of account. But, with such an infinity of forms to draw upon in South America, it should be possible to combine all of the desirable features. Some of the Peruvian varieties are almost ideal in form (page 524).

It seems very strange, in view of the importance attained by the potato, that there should not have been a more general appreciation of this and the other plant treasures that South America has bestowed upon the other continents. Not only the Peruvian varieties of potatoes, but many of the agricultural plants of Peru, are still entirely unknown in other countries. Much less has there been any systematic effort to gain what might be described as an agricultural cognizance of these treasures — that is, a practical knowledge of the nature, habits, and uses



Photograph by O. F. Cook

FARMING AT AN ANGLE OF 45 DEGREES

A slope in the valley of Ollantaytambo, with an angle of about 45 degrees, or steeper than the roofs of most houses, is covered with transverse ridges, showing that the entire surface was cultivated in former times. Parts of the same slope farther to the left are still cultivated. The structures in the foreground are ancient graves or storehouses, perched on a large rock, seen from a ruined town called Pumamarca.

of the plants. Of some of them even botanical information is lacking. Indeed, it may be said that knowledge of some of these plants has actually declined since the time of the conquest.

The account of Peruvian economic plants written by Padre Cobo less than 70 years after the conquest is still the most extensive and detailed work on the subject.

OTHER PERUVIAN ROOT CROPS

The agriculture of Peru is based on root crops, primarily. Seed crops are relatively few, and, with the exception of corn, are almost incidental to the numerous root crops. Even corn is used largely for making *chicha* rather than for food, especially in many districts at higher elevations, where potatoes are the chief article of diet.

In order to understand the domestication of many root crops in Peru, it is necessary to go back to a pre-agricultural or an extremely primitive agricultural state, when people subsisted entirely or very largely upon wild roots, and resorted every year to the gathering of these, instead of being able to rely entirely upon the products of cultivated land, as in a more advanced state of agricultural development. With agriculture developed to the point of complete independence of the wild-food materials, no more domestications of food plants are likely to be made, as none seem to have been made during the entire historical period of civilized European agriculture.

From eating a great number of plants, as the wandering savages do, agricultural man gradually becomes restricted by habit to the foods that are produced by cultivation, and he finally reaches a stage where the idea of going out and bringing in a wild plant to cultivate as food is entirely foreign to the mind. To the present-day Indians of Peru the cultivated food plants represent a perfectly distinct and definite class. The plants that are sown are sown, and the plants that are wild are wild. They accept as a matter of course that there are wild potatoes, wild ocas, wild añus, wild arracachas, wild achiras, and so on down the list; but it is not supposed that these have anything to do with the cultivated forms of the same types, or that anybody would be foolish enough to plant the wild kinds and expect to raise crops from them.

If any more plants are domesticated in Peru, the Indians are not likely to do it—that is, for their own use. If some new crop should be introduced by the white people, or if a demand should arise for the product of a wild plant that could be cultivated easily, the Indians might go to planting it, for their agricultural habits and instincts are highly developed; but either of these contingencies is very different from a spontaneous domestication of a new native food plant on their own initiative and for their own use.

In the alpine or Andine belt, where the potato is the chief crop, three other root crops are generally grown, by the same methods and often in the same rows with the potatoes. These Andine root crops are the oca (*Oxalis tuberosa*), the añu (*Tropæolum tuberosum*, page 526), and the ullucu (*Ullucus tuberosus*). The tubers of all of these plants are remarkably alike and similar to some of the varieties of potatoes, although the plants have no relation to potatoes or to each other. The *oca* is a relative of our sheep sorrel, the *añu* of the common flowering nasturtium, and the *ullucu* of the Madeira vine. Though not attaining the size of large potatoes, the other tubers are more attractive in appearance and seem to have even better keeping qualities.

The possibility of utilizing them in the cooler parts of the United States is worthy of careful consideration. Their value might lie, as in Peru, in supplementing the potato, and thus affording a more varied vegetable diet. They yield well and are easily grown. Though natives of a tropical country, these crops are found only in the cool elevated districts and are, like the potato, intolerant of high temperatures.

In the lower part of the potato belt there is another root crop—the *yacon* or *llacon* (*Polymnia sonchifolia*)—comparable to the so-called "Jerusalem" artichoke, which is supposed to be a native of Mexico. It produces large, compact clusters of thick, fleshy roots tapering at both ends and with a strong external re-

semblance to sweet potatoes. The flesh is crisp, juicy, and has a pleasant, sweetish flavor, rather better than that of the Jerusalem artichoke. The *yacon* and *ajipa* (*Cacara*) are eaten raw, while all other root crops are cooked.

At elevations below 6,000 feet another series of root crops is grown, consisting of numerous varieties of *rumu* (Manihot), *uncucha* (Xanthosoma), *apichu* and *cumara* (two types of sweet potatoes), *achira* (Canna), and *unguna* (Curcuma).

THE HARVESTING, STORAGE, AND DISPOSITION OF THE CROPS WERE DIRECTED BY THE GOVERNMENT

According to the early Spanish historians, the Incas had complete control of the land and of all of the agricultural activities of the people, from the planting of the seed to the harvesting, storage, and disposition of the crops. An extensive system of public storehouses was maintained, not only at the chief centers of population, but along all of the principal routes of travel and in the high passes between the valleys.

A complete system of accounts was kept by means of *quipus*, or knotted cords, with different kinds and colors of knots to represent different quantities and classes of objects. The system of public accounting was used not only to determine the taxes or contributions to the government, but as a practical form of insurance, a failure or deficiency of crops in one section being made good from other parts of the country, where more abundant harvests had been secured. When the country was devastated at the time of the Spanish conquest the same system of making good the local losses was employed, "in order that all might not be devastated," as we learn from the account of Cieza de Leon,* written probably about 1550:

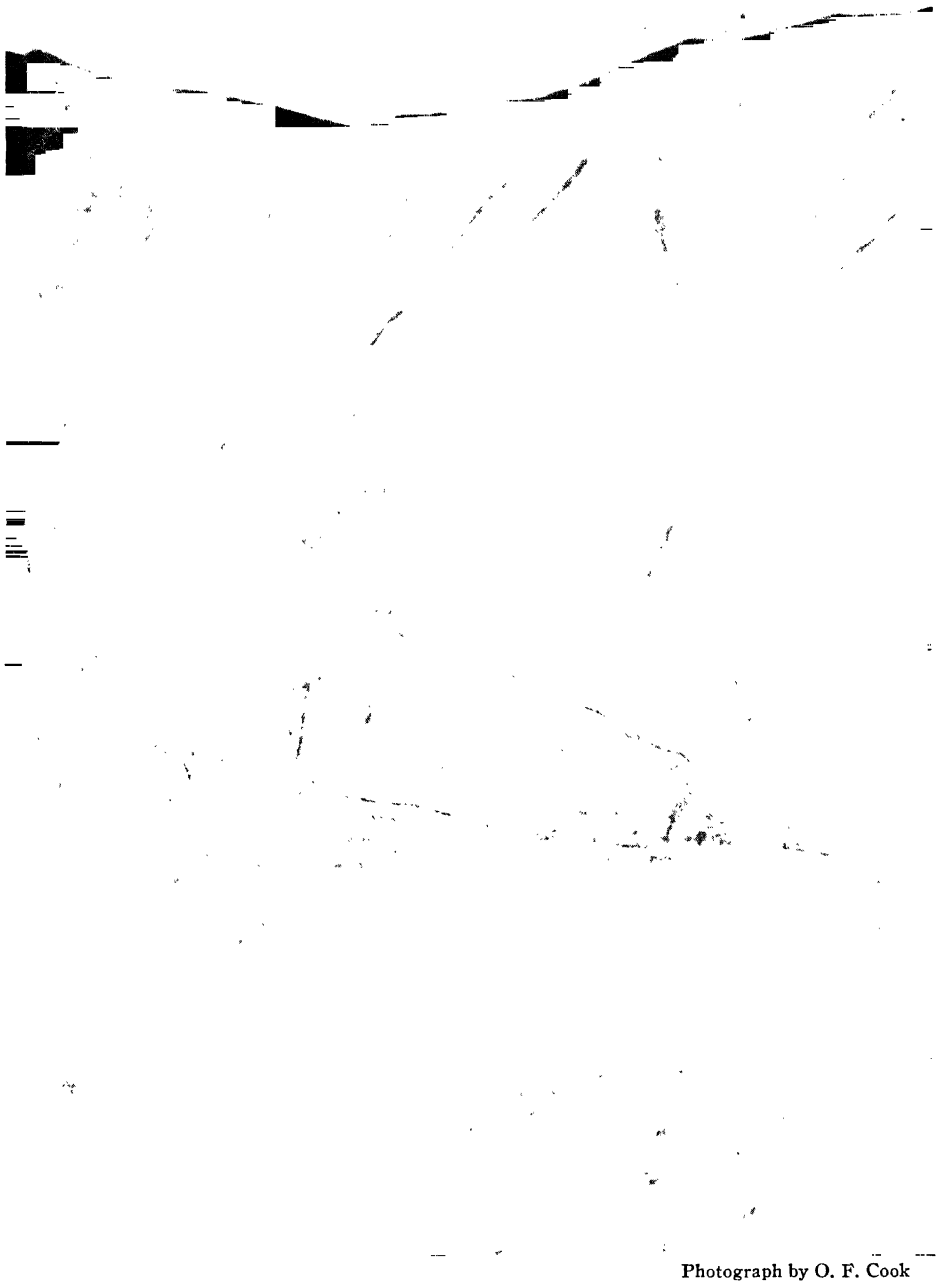
"So it was arranged, and as soon as the Spaniards were gone the chiefs assembled, the *quipus* were examined and checked, and if one province had lost more than another, that which had suffered less made up the difference; so that the burden was shared equally by all. To this day these accounts are kept in each valley, and there are always as many accountants as there are lords, and every four months the accounts are made up and balanced."

In like manner it is apparent from the accounts of the early historians that the recognized object of the religious system was to secure favorable conditions for the growth of the crops. Like many other primitive peoples, the Incas had a system of sacrifices or offerings to secure the favor of the gods. Though not a cruel or bloodthirsty people like the Aztecs, whose sanguinary deities required a continual butchery of captives, there is no longer any doubt that the Incas also had a system of human sacrifices to secure the favor of the deity for the Inca and his people. A special religious caste of vestals or Virgins of the Sun was maintained at some of the chief religious centers, and numerous burials of strangled women have been reported by Uhle at the great temple of Pachacamac, near the coast south of Lima. The object of these sacrifices, as stated in a passage quoted by Uhle from Molina, was "that the Creator might grant the Inca victory, health, and peace."

How thoroughly ingrained and instinctive the Inca system was may be best understood from the extent to which it still persists, nearly four centuries after the conquest. The need of "paying the Incas," in order to be assured of good crops and natural increase of the flocks, is still felt by thousands of the rural Indians and manifested in many ways. In the native markets of all of the larger towns there is an extensive trade in medicinal and aromatic plants, the chief use of which is for burnt offerings to the Incas to avoid the risk of offending them and thus inviting injury or loss.

Other curious survivals of the ancient system are seen in the little images of metal, clay, or stone which are buried in the ground for the benefit of the crops. At Cuzco minute images are made of metal, but at La Paz the same purpose is served by carved stones, called *mullo*

* Cieza de Leon, Pedro de. Second part, Chronicle of Peru, translated by Clements R. Markham, London, 1883, pages 34-35, Hakluyt Ed.



Photograph by O. F. Cook

THE COURSE OF AN ANCIENT AQUEDUCT

The indistinct dark line that crosses the high slope, shown about two inches below the top of the photograph, represents the course of an ancient aqueduct carried for many miles along a mountain wall hundreds of feet above the valley. In the foreground, near the ruined town of Pumamarca, is a group of Inca storehouses. The stream in the bottom of the valley is carried in a straight course along the farther side of the valley bottom. Note canals cutting across mountains (see text, page 498).



Photograph by O. F. Cook

ARTIFICIAL LANDS ALONG THE URUBAMBA RIVER BELOW PISAC

For about a mile the river has been confined by walls to a straight channel and the land leveled to the base of the slope where narrower terraces were built, the first two with broad, sweeping curves (see page 497).

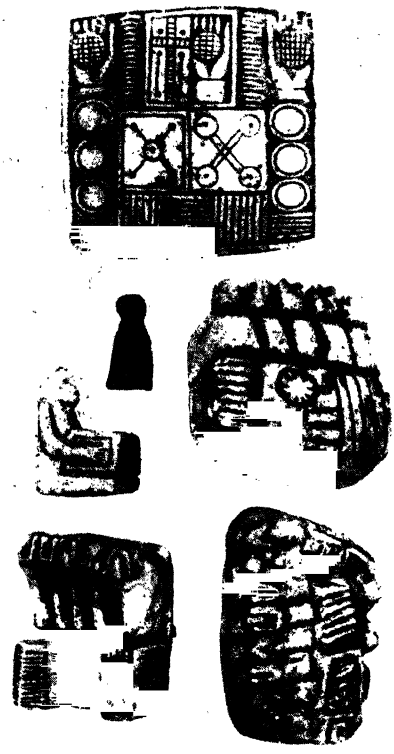
or *piedras de Charasani.* These are still used and sold regularly in the native markets by the dealers in medicines and aromatic drugs. These curious sculptures take the form of small models of fields and farmsteads, with rows of sheep and cattle. They remind one of the colonnades of bulls in Egypt, which may have been constructed for the benefit of the animal industry of the Empire of the Pharaohs.

DESTRUCTION OF THE INCA SYSTEM

Agriculture was a fundamentally important step in the development of civilization, because it constituted the discovery of a way to live and let others live, too. As long as primitive man remained dependent upon game or natural products there was seldom enough to go around. The natural attitude of non-agricultural tribes roaming about in search of food is to fight all strangers on sight, and this attitude persists in many nations that have adopted agriculture as an art, but are not yet converted to it as an ideal or philosophy of existence.

Dominance of the predatory instinct is seen when people would rather raid the harvests of others than raise crops of their own. How thoroughly agricultural were the ancient Peruvians in habits and instincts is evidenced by their greater freedom from the predatory instincts in comparison with our European race. In this respect the Incas were admittedly superior. Several of the early historians give testimony to this aspect of the Inca civilization. Cieza de Leon and other thoughtful men among the conquerors saw very clearly that something had been destroyed that could not be replaced.

The most convincing testimony was given by one of the soldiers who came with Pizarro, the last survivor, he tells us, of the original band, who had the best opportunity of knowing what the Inca organization was before the conquest; and after all of his companions were gone, the idea of regret and remorse for the destruction that had been wrought grew in the mind of this aged warrior. He cast about for a way to discharge his conscience by telling the King of Spain the truth about the Inca civilization. He knew that the king's ear had been sought by many adventurers, who carried tales

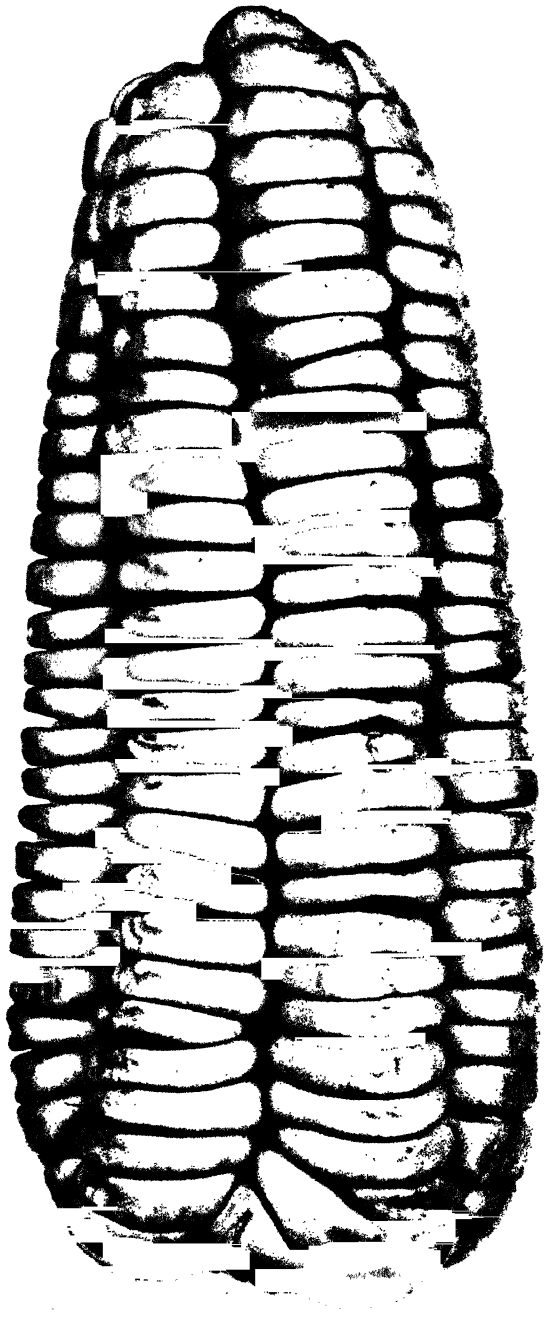


Photograph by O. F. Cook

INSURING AGRICULTURAL PROSPERITY

The rural Indians of Peru still believe in "paying the Incas", for fear that their crops will fail if the ancient observances are neglected. Burnt offerings of drugs and aromatic plants are still made and small images buried in the fields for the benefit of the crops and herds. Such are the stone carvings, called *mullo*, or *piedras de Charasani*, that are still sold in the native market of La Paz, Bolivia, shown in actual size in this photograph. Some of the carvings represent wives, boxes of money, or money in the hand; but most of them are definitely agricultural, showing potato fields, grain fields with irrigation channels, stacks, barns, and ranks of sheep or cattle, like the colonnades of bulls in ancient Egypt.

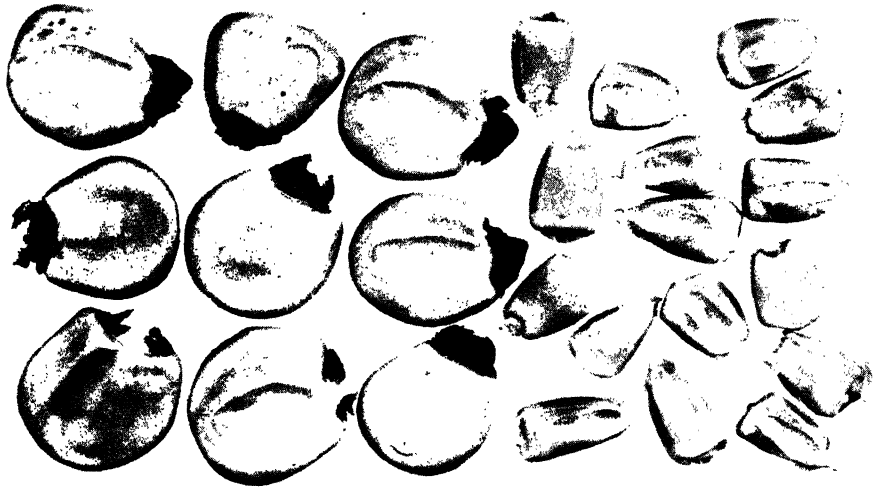
of wrongs to the Indians as a means of securing their own advantage, and that others had countered with tales of barbarous practices among the Indians, some of them fabricated and others carried over from the savage tribes of other parts of America. Also the truth was bitter, and the king might not hear it willingly; certainly nobody who hoped



Photograph by O. F. Cook

CUZCO, THE LARGE-KERNEL CORN OF PERU

In the middle farming zone of Peru, at elevations between 8,000 and 11,000 feet, the Cuzco type of corn is the principal crop. It is characterized by very large kernels, sometimes nearly an inch broad. Cuzco is native to the cool tablelands of Peru rather than the tropical valleys. This fact throws new light on its behavior in the United States. In the hot summer climate of the eastern States it usually fails to set seed, but it may be of use on the Pacific coast or other parts of the United States where there is too little heat for our varieties to mature (natural size).



Photograph by O. F. Cook

THE LARGE CUZCO KERNELS ARE EATEN ONE BY ONE

The huge size of the Cuzco kernels (shown on the left) is more apparent when compared with the kernels of Boone County white, one of our popular varieties (shown on the right). The large kernels are eaten one at a time in Peru, like grapes or chestnuts. The meat slips out of the skin when the boiled kernel is pressed between the thumb and finger. Ripe corn is eaten this way, as well as green corn, and is a staple article of diet among the Indians, who call it *moti* (natural size).

for royal favor would undertake to deliver such a message.

AN IRREPARABLE LOSS

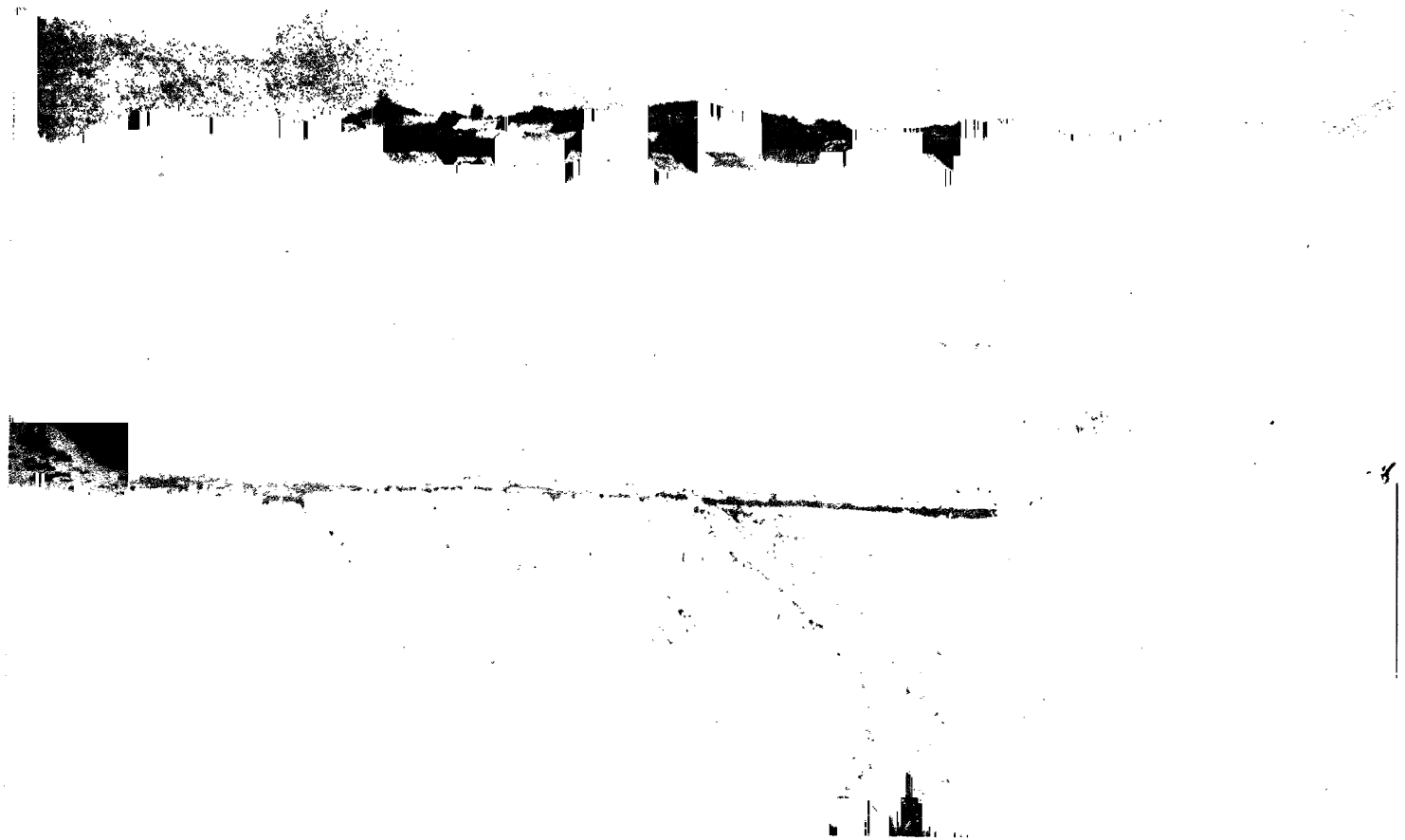
The problem was not easy; but the aged warrior had a resourceful mind as well as an active conscience, and he found a way to give his testimony a lasting record. Instead of setting out on a vain journey to the court of Spain, he waited quietly at Cuzco and let death deliver his message to the king. As the last of the conquistadores, he claimed the right to send the king a legacy of truth regarding the Incas:

"True confession and protestation in the hour of death by one of the first Spaniards, conquerors of Peru, named Marcio Serra de Lejesama, with his will proved in the city of Cuzco on the 15th of November, 1589, before Geronimo Sanchez de Quesada, public notary.

"First, before beginning my will, I declare that I have desired much to give notice to his Catholic Majesty King Philip, our lord, seeing how good a Catholic and Christian he is, and how zealous in the service of the Lord our God, concerning that which I would relieve my mind of, by reason of having taken part in the discovery and conquest of these countries, which we took from the Lords Yncas, and placed under the royal crown, a fact which is known to his Catholic Majesty.

"The said Yncas governed in such a way that in all the land neither a thief, nor a vicious man, nor a bad, dishonest woman was known. The men all had honest and profitable employment. The woods, and mines, and all kinds of property were so divided that each man knew what belonged to him, and there were no lawsuits. The Yncas were feared, obeyed, and respected by their subjects, as a race very capable of governing; but we took away their land, and placed it under the crown of Spain, and made them subjects.

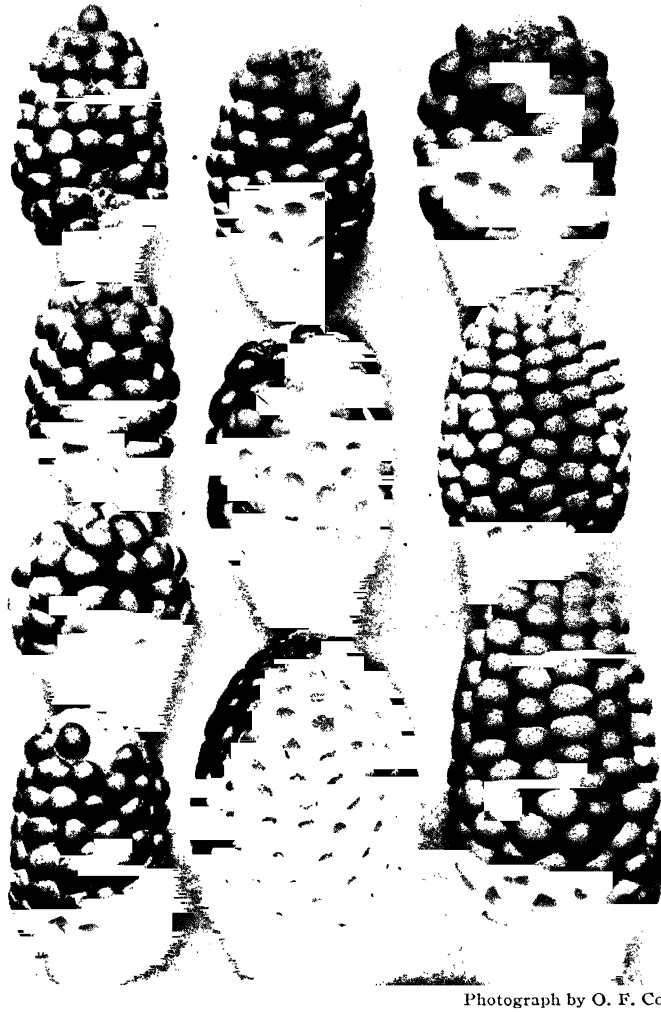
"Your Majesty must understand that my reason for making this statement is to relieve my conscience, for we have destroyed this people by our bad examples. Crimes were once so little known among them that an Indian with one hundred thousand pieces of gold and silver in his house, left it open, only placing a little stick across the door, as the sign that the master was out, and nobody went in. But when they saw that we placed locks and keys on our doors, they understood that it was from fear of thieves, and when they saw that we had thieves amongst us, they despised us. All this I tell your Majesty, to discharge my conscience of a weight, that I may no longer be a party to these things. And I pray God to pardon me, for I am the last to die of all the discoverers and conquerors, as it is notorious



Photograph by O. F. Cook

AGRICULTURE IS STILL PRACTICED INTENSIVELY HERE

These terraces, of rather irregular form, are in a thickly inhabited district about the temple of Viracocha, near Tinta, in the Vilcanota Valley, at an altitude of about 11,000 feet



Photograph by O. F. Cook

PIGMY CORN OF THE HIGHEST ALTITUDES, PICTURED SEVEN-EIGHTHS NATURAL SIZE

The culture of maize is carried to its extreme limit in a few places on the islands and slopes around Lake Titicaca, at an elevation of nearly 13,000 feet. The diminutive ears were bought in the market at Copacabana, on the south shore of the lake, where a great fair is held annually, near the end of the winter season, in August. In a planting of this type of corn on our Pacific coast, near San Diego, last year ears about twice as large were matured in sixty days, indicating that the Copacabana corn may be of use in breeding varieties for short-season conditions in the United States.

that there are none left but me, in this land or out of it, and therefore I now do what I can to relieve my conscience." *

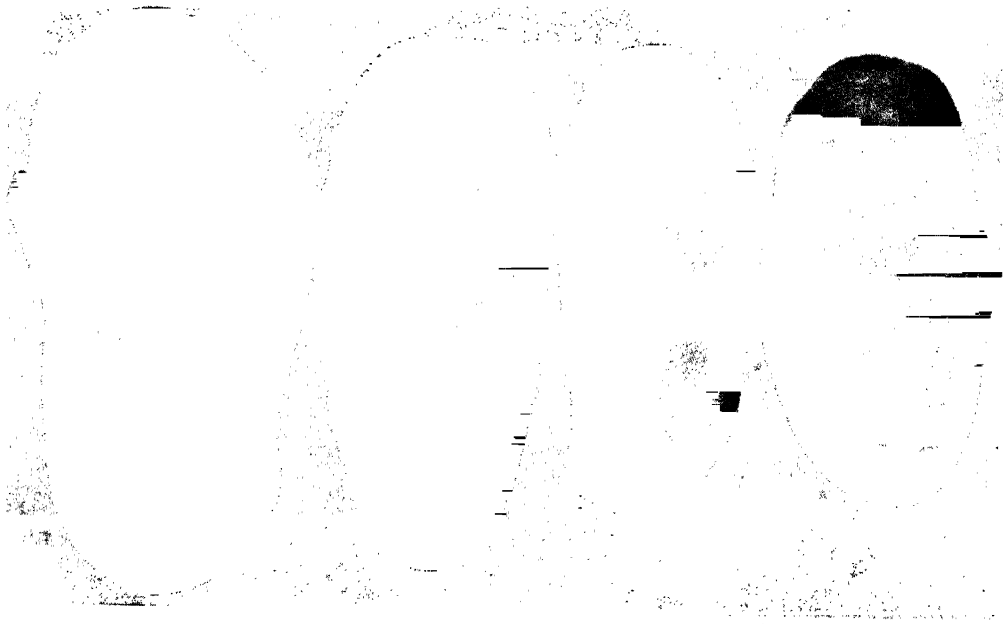
The message carried its own verification. In testifying to the virtues of another race, Serra showed himself possessed of the highest virtues of his own, the love of truth and fairness, and a kindly interest in human welfare, beyond all bigotry of country, creed, or race. Many Spaniards appreciated the Incas, but were powerless to save them. The individual was helpless, for it was a clash of systems, with no basis of common understanding. Writers of large historical works like Garcilasso de la Vega and Cieza de Leon may be suspected of color-

* The Travels of Pedro de Cieza de Leon; translated by Clements R. Markham. Volume 33, Hakluyt Society, pages 32-33, 1864.



SIXTEEN POTATO VARIETIES FROM ONE FIELD

The pile is a mixture of many varieties grown at a high elevation near the Pass of Panticalla. The natives do not grow fields of separate varieties, although they distinguish and have names for many different sorts, which are widely recognized.

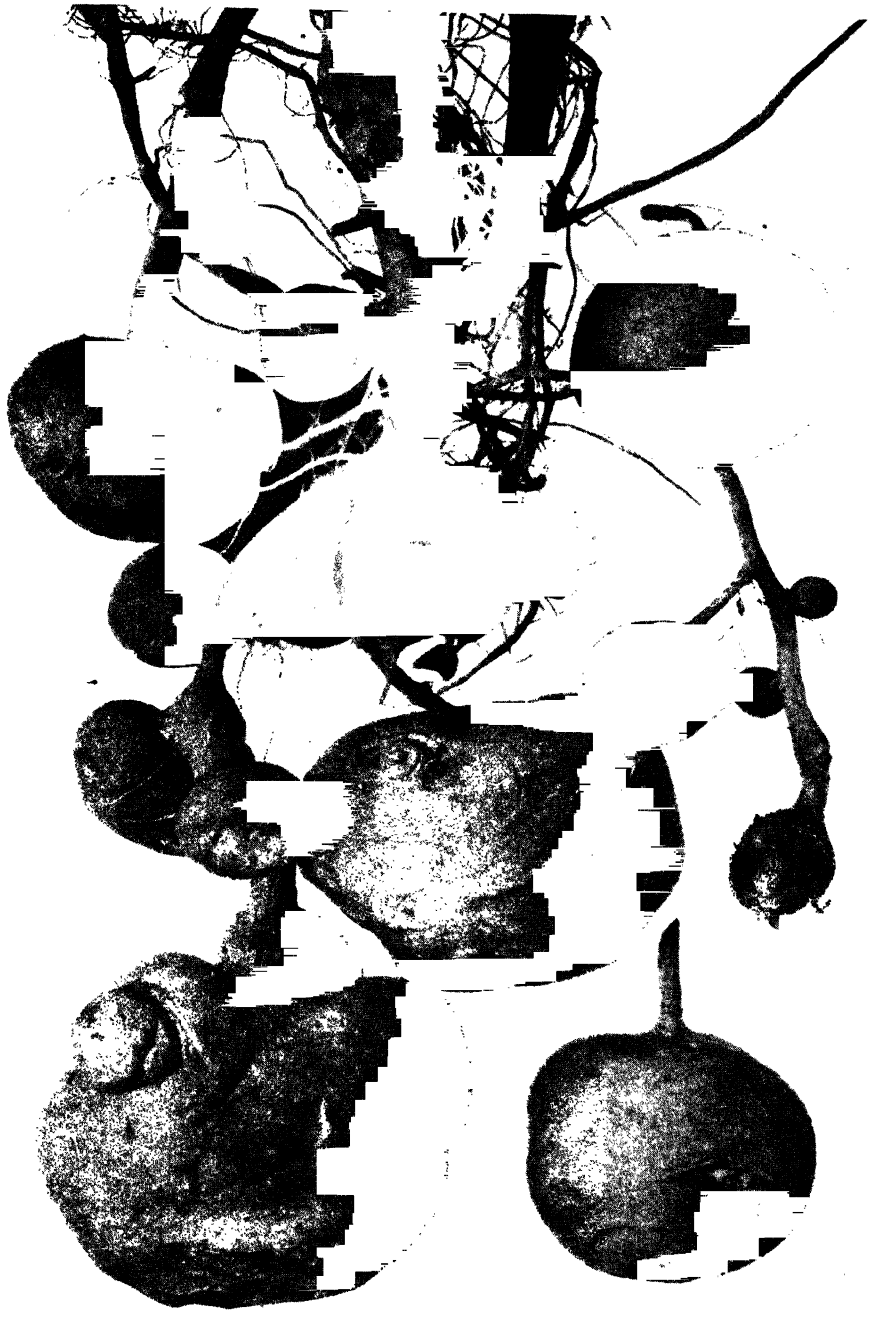


Photographs by O. F. Cook

THE POTATO, PERU'S GIFT TO MANKIND, HAS ENRICHED THE WORLD MORE THAN THE IMMENSE HOARDS OF GOLD TAKEN BY THE SPANIARDS

(SEE TEXT, PAGES 510-515)

The popularity of a potato in our market depends largely on whether it is easy to handle and peel. It would be hard to imagine a more convenient potato than this Peruvian variety, called *Pucasuaylla*, of regular, oblong, flattened form, even surface, and few, shallow eyes. It was found by Professor Bingham between Pucyura and Arma, at an altitude of about 12,000 feet (slightly reduced).



Photograph by O. F. Cook

THE HARDIEST POTATO

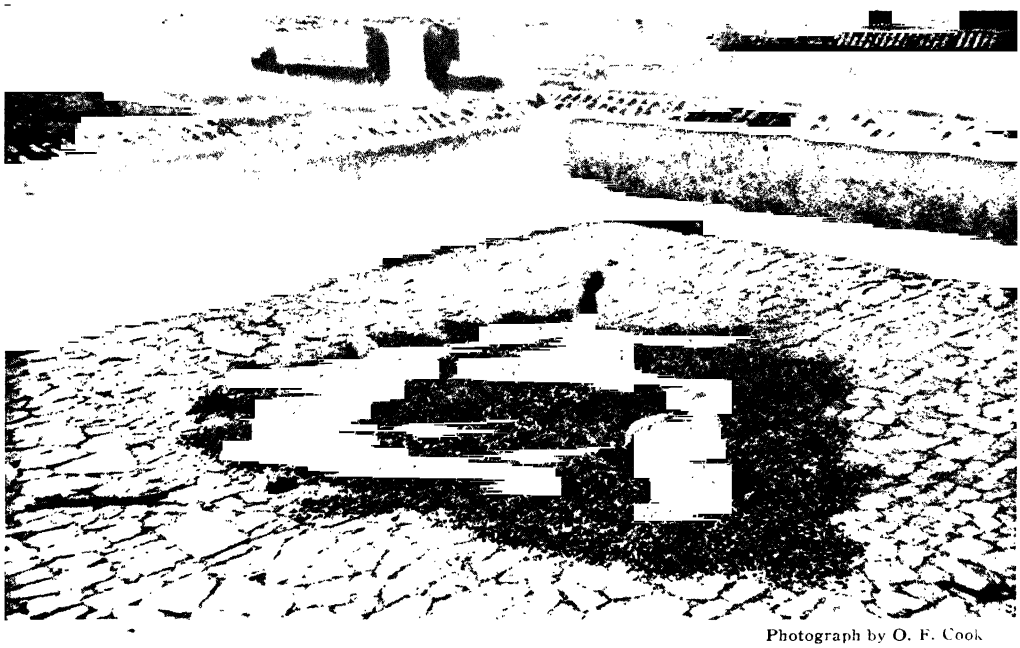
A variety of potato grown at the upper limit of cultivation, on the high slopes near the Pass of La Raya, at an elevation of over 14,000 feet. The neighboring vines had their leaves killed by the frost, but this plant was entirely uninjured. Both the rootstocks and the tubers are bluish purple. The variety called *Tutu* is said not to be edible in the fresh state, and to be used only for the making of *chuños* by freezing and drying (natural size).



Photograph by O. F. Cook

IN ADDITION TO THE POTATO, PERU HAS ORIGINATED MANY VALUABLE ROOTS (SEE PAGES 513-515)

These are not specimens of hand-decorated Japanese art, but were striped by nature before the tubers were dug. Why the subterranean part of a plant should be decorated with purple stripes is hard to imagine, but the case may be interesting to those who believe that colors must be useful. Two varieties are shown, both called *Checjcheañu,* at Ollantaytambo. The variety at the right, with the larger and more irregular tubers, also has the stripes fewer, shorter, and of a deeper purple color (natural size).



Photograph by O. F. Cook

COCA-DRYING YARD AT SANTA ANA

The leaves are spread out on the stone pavement and dry rapidly in sunny weather. Rainy weather interferes seriously with the drying operation, for the leaves may have to be spread out and carried in several times. If a sudden rain wets the coca before it can be taken under cover, the leaves are discolored and their commercial value is reduced.

ing their accounts to convey a special impression, but no literary bias can be suspected in Serra. He tells us only a few facts, but in a way that proves his competence to speak. His testimony is not in conflict with the best historians, but more vital and convincing.

If Serra had charged the destruction of the native civilization to Pizarro or to any of those afterward in authority in Peru, it would be possible to suppose that his view of the Inca organization was colored by revenge or lasting resentment against some of his own people; but of this there is no indication. He includes himself with the others, blames nobody, and suggests no remedies. Telling the truth to the king is all that he undertakes; but in doing that he lifts the curtain of the past and lets us see for one moment through his eyes, not the mountains or the monuments or the crops of Peru, but the living Inca people and their relations to each other, the most essential condition of the development of the ancient civilization.

THE INCAS HAD THE MOST COMPLETE SOCIAL ORGANIZATION OF WHICH WE HAVE RECORD

We see that the Inca agricultural system was not only the most complete form of social organization of which we have any record, but also gave the most adequate adjustment of the human relations that lead to continual conflict and confusion in other forms of society.

This is not saying that the Inca system was the best possible, or that it was calculated to lead to the highest development of humanity, or that we should adopt it; but the system is interesting and worthy of being understood, since social organization undoubtedly was a very important factor in enabling the Incas and their predecessors to accomplish what they did in agriculture and the attendant arts. Certainly no unorganized people could have executed the ancient reclamation projects or established themselves under so wide a range of natural conditions or domesticated such a varied series of crop-plants. In domesticating these plants



Photograph by O. F. Cook

WHERE FARMING IS UPHILL WORK

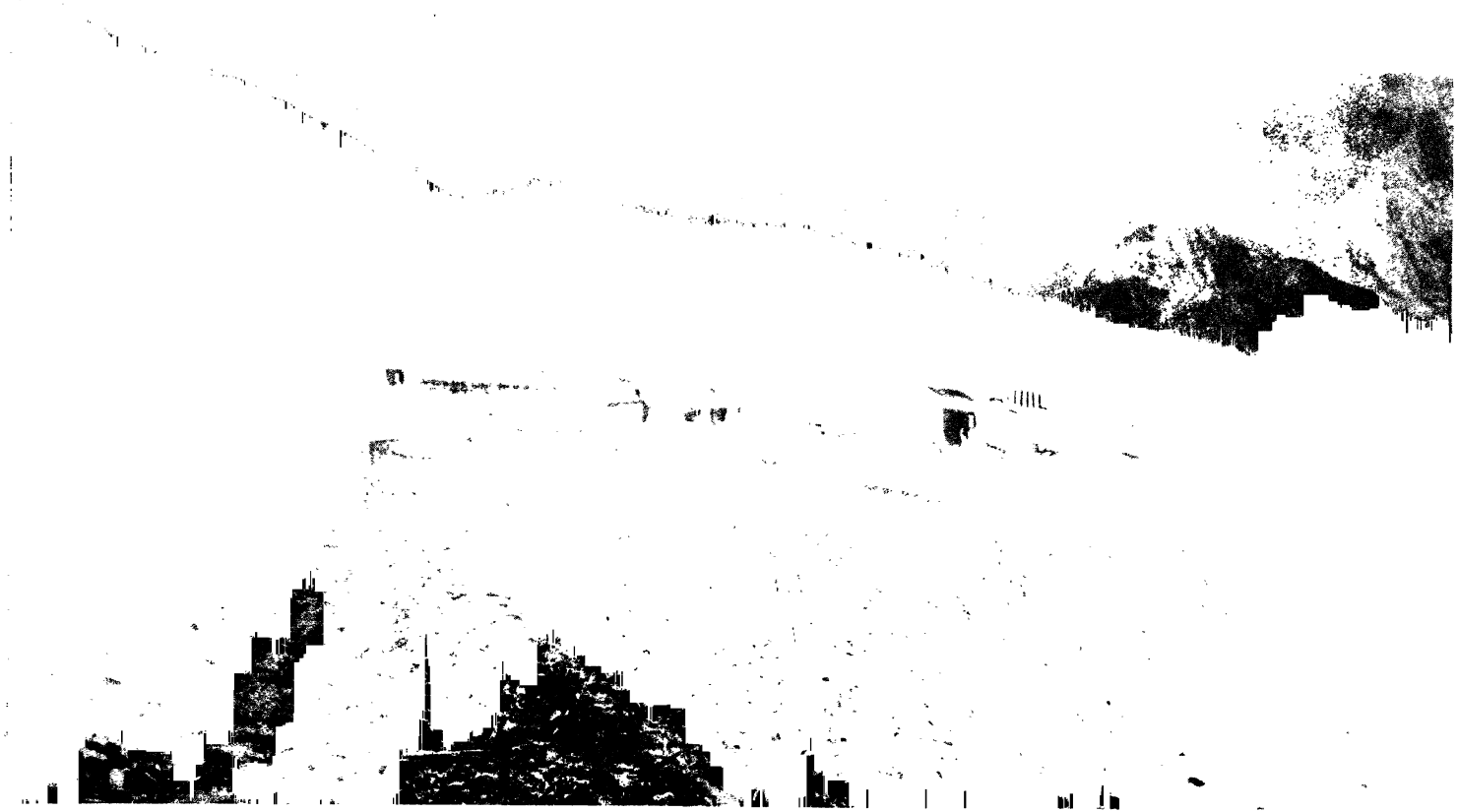
This coca plantation is on a very steep hillside near Colpani, in the lower Urubamba Valley, at an elevation of about 5,000 feet. Many plantations are made in this way on steep slopes. Contrary to the custom that prevails in most tropical countries, the rows always run up and down the slope instead of across.



Photograph by O. F. Cook

LEAVES, FLOWERS, AND MATURE BERRIES OF THE COCA PLANT

All the parts are shown in natural size. The leaves, which are the source of the cocaine drug, are very peculiar. The two surfaces are quite unlike—the upper, deep green, smooth, and velvety; the lower, light green, with a band of paler color on each side of the midrib, inclosed by fine ridges. The young leaves are rolled in from the margins, so that only this median band of the lower surface is exposed at first.



Photograph by O. F. Cook

A LARGE COCA PLANTATION AT SANTA ANA

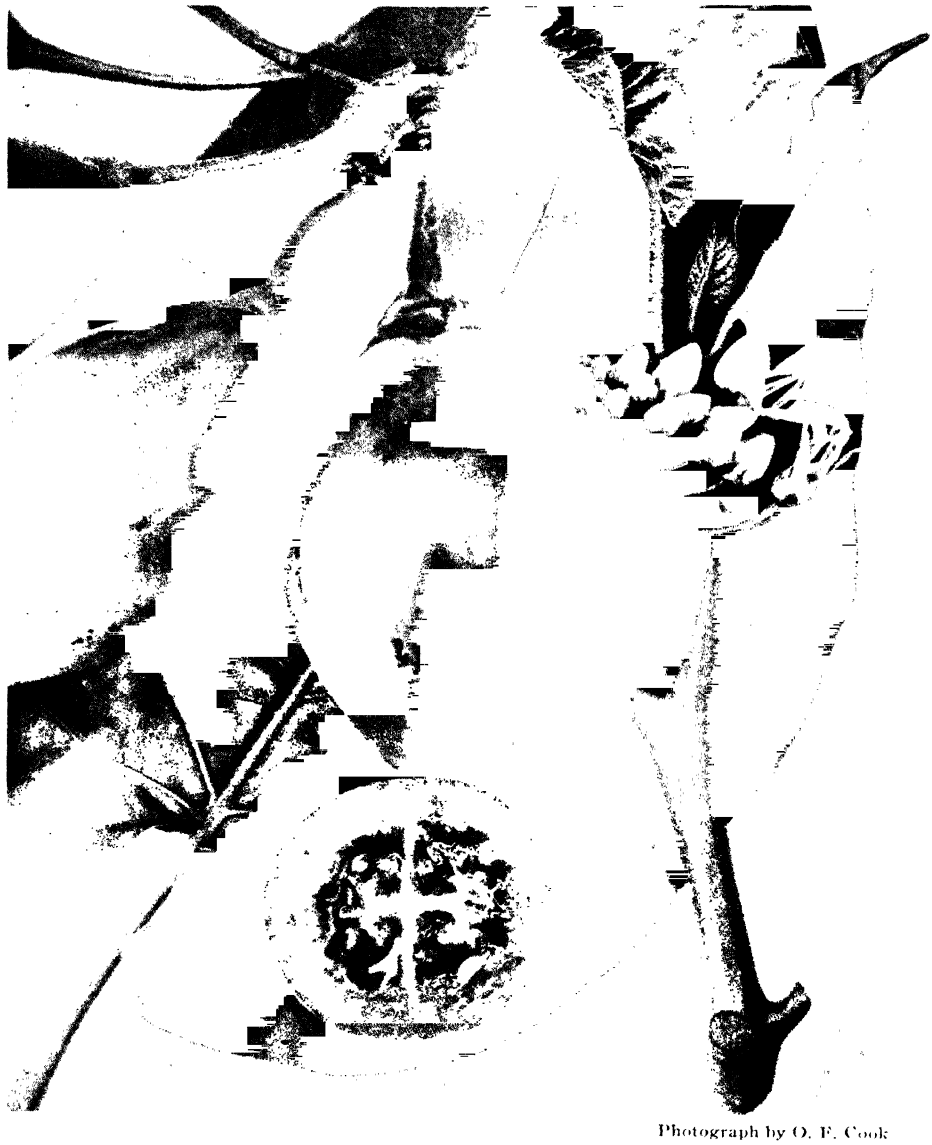
The crop of leaves has just been harvested, leaving the bushes stripped. As soon as the leaves are gathered, the plantation is irrigated and another crop of leaves begins to grow, and matures in about three months. With four crops in a year a good coca plantation is very profitable for the owner and government (see page 473), but a cause of much misery and degradation to the people. Santa Ana is a famous place, having been the chief center of missionary activity in the eastern valleys of the Andes in the early colonial period. The buildings were constructed by the Jesuit fathers.



A NATIVE PERUVIAN COTTON

Photograph by O. F. Cook

Leaf, flower, and boll of the native cotton grown in the eastern valleys of the Andes. This species (*Gossypium barbadense*) is entirely different from any grown in the United States. The plant is somewhat like the Sea Island cotton, but the bolls are much larger than those of Sea Island and the fiber is more like Upland cotton (natural size).



Photograph by O. F. Cook

THE TREE TOMATO, CYPHOMANDRA

It is a relative of the true tomato, but is more upright, with a single strong stalk and horizontal branches at the top, forming a small tree five or six feet high. The fruits are narrowed at both ends, yellowish red in color, firmer in texture than our tomatoes and with a somewhat stronger taste. The plant endures more cold than the true tomato and is cultivated at elevations of 6,000 to 10,000 feet, whereas the true tomato is raised only in the warm valleys, below 6,000 feet (natural size).



Photograph by O. F. Cook

A WILD-CHERRY TOMATO OF THE URUBAMBA VALLEY

Wild tomatoes of the cherry type are very abundant in the lower Urubamba Valley about Santa Ana at an elevation of approximately 3,000 feet. The color of the fruits is deep red and the taste very agreeable. The tomatoes cultivated by the Indians are of the same type and the fruits not much larger (natural size).



Photograph by O. F. Cook

A WILD TOMATO OF THE EASTERN ANDES

Growing as a large woody vine at elevations of 8,000 feet, this plant trails over bushes 10 to 12 feet high. The fruits are of uniform size and of the usual form of our cultivated tomatoes. The flesh under the skin is thick and firm, so that the fruits can be handled easily and kept for long periods. There is a possibility of making use of it in hybridizing and breeding new varieties. If such a cross can be made, it may be expected to give a wide range of variation and yield new types of fruit adapted to special purposes, such as woody perennial varieties that can be trained over arbors like grape-vines, or varieties with special flavors, greater firmness of flesh, and improved keeping qualities (natural size).

the ancient Peruvians performed a lasting service for the whole world. We are all beneficiaries of the ancient Peruvian agriculture.

From our point of view, the steep, narrow, rocky valleys of southern Peru would represent a most unfavorable condition for agricultural development; but no doubt the ancient people saw things in a different light, and what they were able to accomplish is a lesson in possibilities that our own race has still to learn. We are beginning to see that the agricultural ideal of human welfare, of living and letting others live around us, is higher than the military or savage ideal of killing all strangers through fear or jealousy of competition. But our traditions, literature, and social institutions are still so largely military or commercial that we have not seriously considered agriculture as an aim or ideal of existence. We have not sent forth our imaginations to grasp a vision of agricultural development, either for humanity as a whole or for our own European race in the new continent that we have overrun but not yet occupied.

VOL. XXIX, NO. 6 · WASHINGTON JUNE, 1916

THE NATIONAL GEOGRAPHIC MAGAZINE

THE WILD BLUEBERRY TAMED

The New Industry of the Pine Barrens of New Jersey

BY FREDERICK V. COVILLE

BOTANIST OF THE U. S. DEPARTMENT OF AGRICULTURE

IN AN article published last year describing the successful outcome of experiments in the growing of trailing arbutus from the seed, the incidental statement was made that "in the first trial blueberry plantation, in the pine barrens of New Jersey, blueberries are now produced of the size and color of Concord grapes."* This allusion aroused so much interest among the readers of the NATIONAL GEOGRAPHIC MAGAZINE that the writer has been asked to expand his statement into a description, with illustrations, of the progress that has been made in the new industry of blueberry culture.

Five years ago, in this Magazine, a description was given by the writer of certain physiological peculiarities of the blueberry plant in which it differs fundamentally from the ordinary plants of agriculture.† When given the kind of care, protection, and nourishment usually bestowed on cultivated crops, the blueberry sickens and dies (see picture, page 536).

In a search for the cause of this peculiar behavior it was found that the healthy blueberry plant has on its roots a minute fungus, invisible without the aid of a compound microscope, which, unlike most fungi, appears to be beneficial, not injurious, its particular beneficent action being to furnish nitrogenous food to the blueberry bush. So intimate, indeed, is the relation between the two that the blueberry appears unable to nourish itself properly without the assistance of the fungus.

The problem of blueberry culture, therefore, became primarily the problem of growing the blueberry fungus, and the solution of this second problem lay in the character of the soil. The blueberry fungus requires an acid soil, and it thrives best in one composed of leaf peat and sand. The pine barrens of New Jersey afford just that kind of soil, with every variation in moisture from permanent bog to areas of pronounced aridity.

The failure of earlier experimenters, and there have been several in the last 50 years, to establish an industry of blueberry culture was due primarily to their failure to recognize that an acid soil is the first essential of successful blueberry production.

Before showing what has been done in the way of commercial blueberry culture in the pine barrens of New Jersey, it may be well to contrast an illustration of the

* The Cultivation of the Mayflower. NATIONAL GEOGRAPHIC MAGAZINE, May, 1915.

† Taming the Wild Blueberry. NATIONAL GEOGRAPHIC MAGAZINE, February, 1911.



Photograph from U. S. Department of Agriculture

BLUEBERRY PLANTS, SHOWING THE BENEFICIAL EFFECT OF ACID SOIL AND THE INJURIOUS EFFECT OF RICH GARDEN SOIL

The three large blueberry plants, one year old, were grown in a greenhouse in a peat soil. All three are over twenty-four inches high. Standing on the middle pot is a small glass pot containing a seedling of the same age and origin as the others, but potted in a rich garden soil. The difference in results shows the fundamental importance of a peaty acid soil for blueberry culture.

greenhouse blueberry of 1911 with that of 1916, for the greenhouse and laboratory experiments have been the constant guide of the field plantation (see pages 538 and 539).

While the largest individual berries have been grown in the greenhouses at Washington, the finest clusters and the best formed and most productive bushes have been reared outdoors in the New Jersey plantation. Furthermore, the field plants have reached the stage of commercial bearing at a much earlier age than was expected from observations on the greenhouse plants.

In the article published in 1911 the conservative view was advanced that blueberry seedlings or cuttings would come into profitable bearing, under proper culture, in five to ten years. In the New Jersey plantation hybrid seedlings have borne their first commercial crop when only three years old and a crop three times as large when four years old.

THE BLUEBERRY BUSH LIVES A MAN'S LIFETIME

Under such favorable conditions as exist in the pine barrens, therefore, blueberry culture is to be classed, as to the age of first bearing, not with the slow-fruiting apple orchard, but with the quick-fruiting peach, with this important difference, however, that while the peach tree remains in vigorous fruiting condition for comparatively few years, the blueberry bush, with suitable pruning, bids fair to last a man's lifetime and even longer.

There was once pointed out to me by a man of sixty a handsome, vigorous blueberry bush which he had known from his boyhood and which he said seemed to him just as large and vigorous then as now, and just as highly distinguished among all the blueberries of the region, for it was an albino bush and bore delicious white blueberries for the boys at the swimming-hole in his childhood just as it does today.

Still further prospects of longevity does the wild blueberry possess. The tall decrepit veteran with densely interwoven and half-dead twigs and feebly moving sap in its old and rheumatic limbs has a means of rejuvenation which nature has not granted to the trees of the old apple orchard. If such an old blueberry bush is burned to the stump, there springs from its ashes a new bush, characterized



Photograph from U. S. Department of Agriculture

BLUEBERRY PLANT, SHOWING THE EFFECT OF COLD IN STIMULATING GROWTH

The stem at the right was kept outdoors, through a hole in the glass side of a greenhouse, exposed to repeated freezing and thawing during the winter months. When spring came this outdoor stem burst into growth, as shown in the illustration; but the stem at the left, which was inside the warm greenhouse all winter, remained completely dormant. A knowledge of this influence of cold in stimulating the growth of the blueberry is of fundamental importance in the propagation of choice blueberries by cuttings.



Photograph from U. S. Department of Agriculture

THE GREENHOUSE BLUEBERRY OF 1911

This illustration was published in the NATIONAL GEOGRAPHIC MAGAZINE for February, 1911, as an example of the fruit of a cultivated blueberry. These berries, reproduced in their natural size, were among the first that were produced on greenhouse plants. The plant itself was a seedling from a large-berried wild bush.

not only by the symmetry and beauty of youth, but by youth's vigor and fruitfulness as well. The wild blueberry is the real and literal phœnix among fruits.

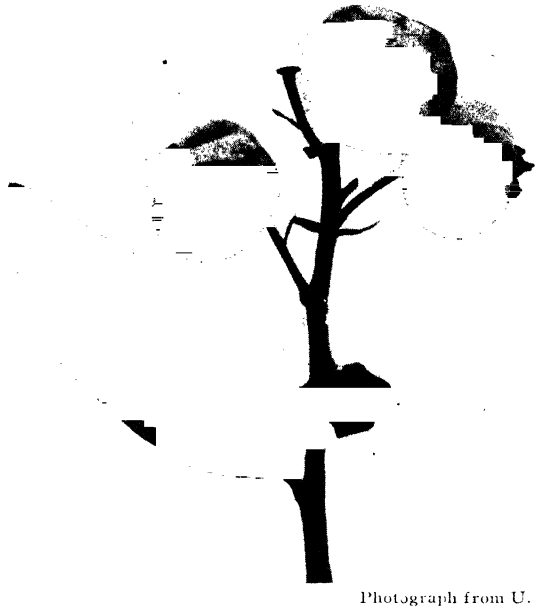
BLUEBERRIES ARE AS DIFFERENT AS INDIVIDUALS

The development of a large-fruited blueberry is very desirable from the standpoint of the grower, for not only is the cost of picking much reduced, but the market price is much increased. One characteristic of the blueberry, however, is of far more importance than size, namely, flavor. When one buys blueberries in the market he gets a mixture of berries from many bushes, and the composite flavor is always good.

It would be a mistake, however, to infer that the blueberries from all wild bushes are of good flavor. They are not. In selecting wild bushes bearing large and handsome berries, to be used as breeding stocks, it has been found that some wild blueberries are sour, others insipid, other rank or even bitter in taste.

All bushes whose berries are devoid of sweetness and the special flavor that characterizes the most delicious blueberries are rejected for breeding purposes, however large or externally beautiful their fruit may be. It is confidently expected that the hybrids produced from such selected parents not only will average better in flavor than the wild berries, but that an occasional hybrid will excel in this respect the best wild berries that we know (see pages 540 to 543).

The improved and cultivated blueberry will be above criticism as to the size of its seeds. All the large-seeded species of this class of berries belong to the true



Photograph from U. S. Department of Agriculture

THE GREENHOUSE BLUEBERRY OF 1916

This cluster contains the largest blueberry produced up to the present time. It measured seven-eighths of an inch in diameter. A bud from the largest-berried plant thus far known was inserted on a very vigorous seedling stock, was forced to rapid and luxuriant growth in the greenhouse, and finally was made to produce these berries. They are shown in their natural size.

huckleberries, and none of these has been used in the breeding experiments.*

PROPAGATED BY CUTTINGS

From the many thousand hybrids testing and to be tested in the New Jersey trial plantation a few bushes bearing the best-flavored, largest, and handsomest berries will be selected for further propagation. Like selected varieties of apples, selected blueberries cannot be propagated successfully from the seed. They do not come true in that way. They do come true, however, when budded or grafted; but, as new shoots are continually springing up below the graft, these methods also cannot be applied satisfactorily to the blueberry.

As early as 1909 it was appreciated that propagation must be effected by cuttings or some similar method, if a particular selected bush was to be perpetuated and increased on a commercial scale. The various methods followed by gardeners in the rooting of cuttings of ordinary plants were faithfully tried, but without success. Thousands of cuttings that started well drooped and died in the cutting beds.

It became evident that new methods

* In the southern United States and in the Middle West blueberries are not ordinarily distinguished from huckleberries, but in New England the distinction is very clearly drawn. The name huckleberry is there restricted to plants of the genus *Gaylussacia*, the berries of which contain 10 large seeds with bony coverings like minute peach pits, which crackle between the teeth. The name blueberry is applied in New England to the various species of the genus *Vaccinium*, in which the seeds, though numerous, are so small that they are not noticeable when the berries are eaten. It is probable that the comparatively low estimation in which this fruit is held in the South is largely due to the lack of a distinctive popular name and the consequent confusion of the delicious small-seeded southern Vacciniums with the coarse large-seeded Gaylussacias. It is the culture of the small-seeded blueberries only, as distinguished from the large-seeded huckleberries, that is here advocated.



Photograph from U. S. Department of Agriculture

THREE-YEAR-OLD BLUEBERRY HYBRID IN COMMERCIAL BEARING

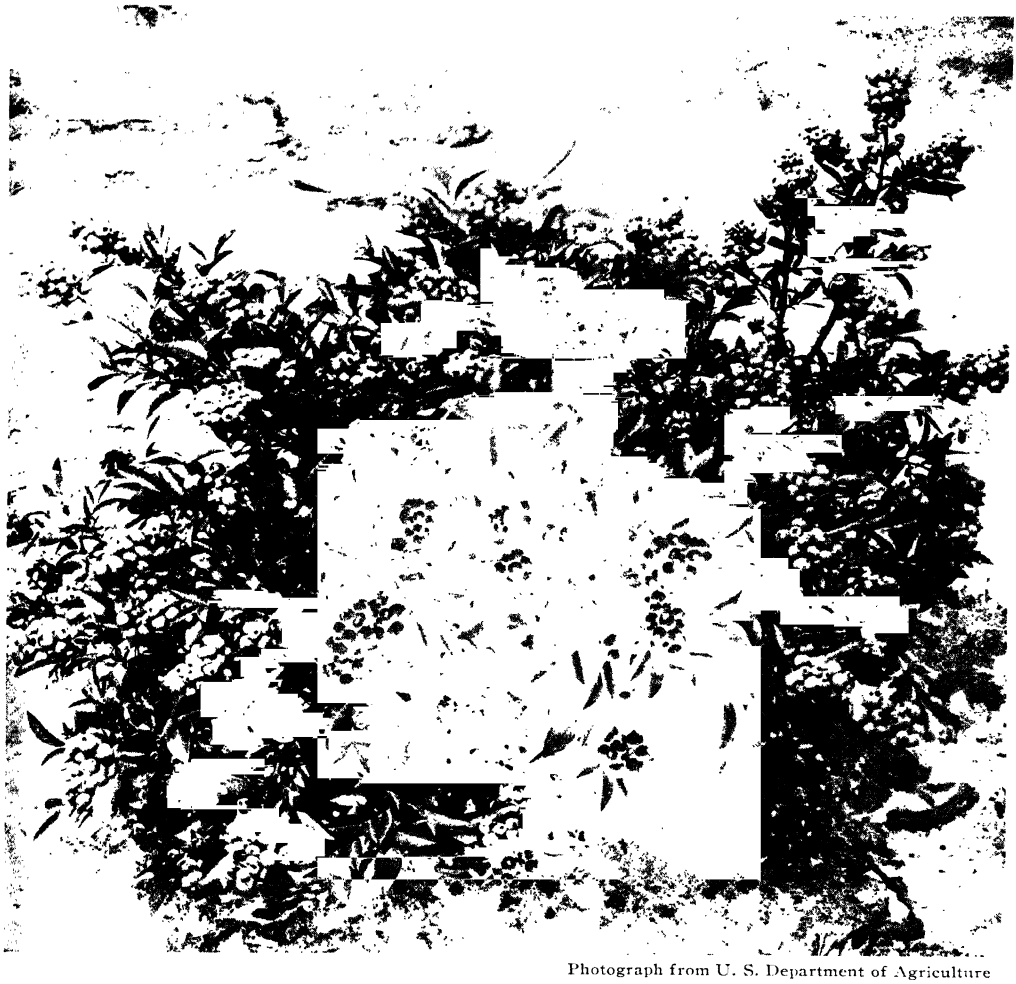
This plant is a hybrid between two selected wild stocks, from Greenfield, New Hampshire, and Brown Mills, New Jersey. They were hybridized in the greenhouses at Washington in the summer of 1912 and the hybrid seeds were sown September 9. The young plants were carried over winter in the greenhouse, and early in September, 1913, they were set out at Whitesbog, in the New Jersey pine barrens. The photograph was taken July 27, 1915, when the plant was a little less than three years old. It is about one-fifth natural size.

must be devised for the rooting of blueberry cuttings, and a detailed study of the subject was therefore begun. For the first few years the varying course of the experiments with cuttings brought a continual alternation of high hopes and severe disappointments.

During those years, however, there began to accumulate from the experiments a definite knowledge of what not to do, and at the same time glints of future success came from occasional cuttings that did develop roots and grow into healthy plants. At last the way became clear, and now cuttings of the choicest plants can be rooted and grown with almost the certainty of seedlings.

THE EFFECT OF COLD

Some of the discoveries made in the course of this investigation are sufficiently curious to be of general interest. One of these is the effect of cold in stimulating the growth of the plant. After



Photograph from U. S. Department of Agriculture

FOUR-YEAR-OLD BLUEBERRY HYBRID

This is one of a series of hybrids made in 1911 between selected wild plants of a low-bush blueberry (*Vaccinium angustifolium*) and a high-bush or swamp blueberry (*Vaccinium corymbosum*), both from Greenfield, New Hampshire. The photograph was taken July 7, 1915, in a field plantation at Whitesbog, New Jersey. The bush bore two quarts of berries and is shown about one-sixth natural size. This lot of hybrids yielded at the rate of twenty bushels of berries per acre at a spacing of three by five feet.

consideration of the puzzling misbehavior of blueberry plants in the greenhouse in winter, the following experiment was tried.

A small opening was made in the glass side of a greenhouse in early January, and through this opening was pushed one of the two stems of a blueberry plant which up to that time had been kept in the warm atmosphere of the greenhouse. The open space about the stem where it passed through the glass was then carefully plugged with moss. During the rest of the winter the plant remained in the same position, the pot and one stem continuing in the warm temperature of the greenhouse, while the other stem, projecting through the glass, was exposed to the rigors of winter, with its alternate freezing and thawing.

When spring came the outdoor stem burst into leaf in the usual manner of a wild blueberry plant, but the stem that had been in the warm greenhouse all win-



Photograph from U. S. Department of Agriculture

A CLUSTER OF OUTDOOR BLUEBERRIES ON A THREE-YEAR-OLD HYBRID

This cluster of berries, which is of natural size, was grown on one of the hybrid bushes in a plantation at Whitesbog (near Brown Mills), in the pine barrens of New Jersey. The berries had a very light blue color, firm but juicy flesh, exceptionally delicious flavor, and seeds so small as not to be noticed when the berries were eaten. The small berries on the cluster were still green. Such berries increase rapidly in size during the few days of ripening.

ter showed neither leaves nor swelling buds. Although perfectly healthy, it remained completely dormant, notwithstanding the fact that it had been surrounded for months by just the conditions of warmth and moisture that ordinarily make blueberry plants grow luxuriantly (see page 537).

The experiment was repeated many times, with various modifications. In some instances the pots were kept outside the greenhouse and one of the stems



Photograph from U. S. Department of Agriculture

PLANTATION OF THREE-YEAR-OLD BLUEBERRY HYBRIDS AT WHITESBOG, NEW JERSEY

These hybrids, photographed in their third year from the seed, were then producing their first commercial crop, seven bushels per acre. The rows are five feet apart and the plants three feet apart in the row, too close a spacing for a permanent plantation (which should be eight by eight feet), but correspondingly more productive in the earlier years.

inside. In other cases the stems were severed from the root, packed in moss or moist sand to prevent drying, and exposed inside or outside the greenhouse.

From these experiments the fact was definitely established that when a blueberry plant has completed its active growth of spring and summer, and later in the season has gorged its twigs, stems, and roots with starch and other storage foods for early spring use, it becomes dormant and, shedding its leaves, refuses to grow again at the temperatures which in spring and summer would be most favorable to its growth.

But after the plant has been exposed to prolonged chilling, at a temperature a little above freezing, it is ready again to grow, and then it is that under the influence of warmth, whether furnished naturally by the sunny days of spring or artificially from the rusty heating pipes of a greenhouse, the buds swell and the plant leaps forward in a riot of rejuvenescence and reproduction.

One change that takes place in the blueberry stems during the period of chilling is the transformation of the stored starch into sugar. The starch must first be turned into sugar before the plant can use it for food, and that change the chilling accomplishes. In the warm



Photograph from U. S. Department of Agriculture

SELF-POLLINATION VERSUS CROSS-POLLINATION

These two twigs, both shown in natural size, were in equally good situations on the same bush, contained the same number of flowers, all pollinated by hand at the same time with equal care, and the fruits were photographed on the same day. The only difference in treatment was that the pollen used on the left-hand twig came from other flowers on the same bush, while the pollen for the right-hand twig was taken from another bush. The cross-pollinated flowers produced a full cluster of handsome berries. The self-pollinated flowers produced no ripe fruit, all the berries that set remaining small and green and later dropping off, until at the time the photograph was taken only two imperfect ones remained. A plantation made up wholly from cuttings from a single bush would produce little or no fruit. At least two original propagation stocks are necessary.

greenhouse there is no accumulation of sugar, the starch remains in storage, and no growth takes place.

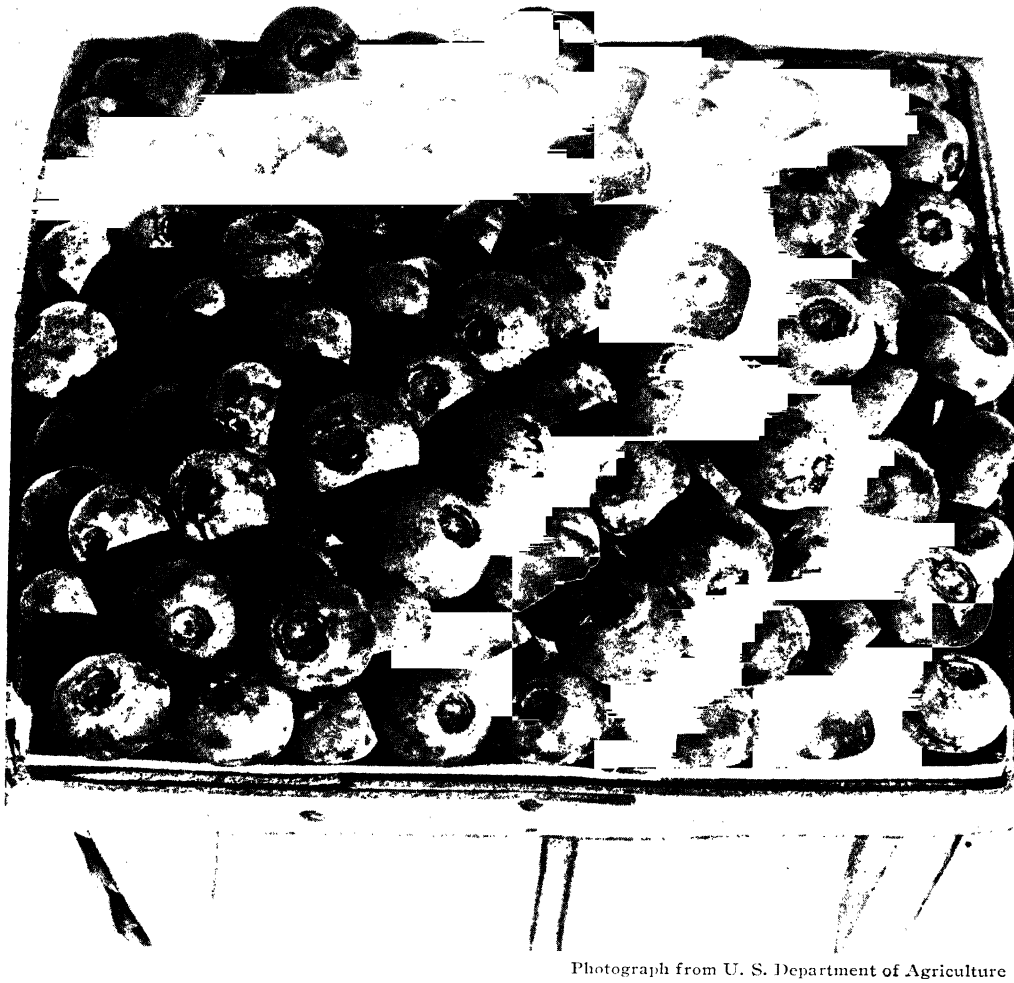
THE BUDS ARE PUSHED OPEN BY ENORMOUS INTERNAL PRESSURE

Along with the formation of the sugar, and caused in part by its accumulation, there develop within the minute cells of the plant enormous internal osmotic pressures, which enable the plant to push its buds open.

These pressures are frequently as high as seven atmospheres, or more than 100 pounds to the square inch—a stress that would start a leak in a low-pressure steam-engine. The pressures may become as high as 30 atmospheres, or 450 pounds to the square inch—a force sufficient to blow the cylinder head off of a thousand-horsepower Corliss engine.

The reason that the plant does not explode is because it is broken up into many extremely small and strongly built cells instead of having one big interior cavity. These minute chambers are often as thick-walled proportionally as an artillery shell and, in the case of the starch-storage cells of the blueberry, are clearly of such construction as to be able to withstand enormous pressures.

It turned out that a full understanding of the behavior of blueberry stems when exposed to prolonged chilling was of the utmost importance in the treatment of blueberry cuttings. Limitations of space prohibit the discussion of other phenomena encountered in the experiments. It



Photograph from U. S. Department of Agriculture

A QUART OF SELECTED FIELD-GROWN BLUEBERRIES

This illustration shows, in its natural size, a quart box of selected blueberries grown in the plantation of Miss Elizabeth C. White, at Whitesbog, New Jersey, in a peaty, well-watered, pine-barren soil. There are thousands of acres of such soil in the southeastern quarter of New Jersey now lying unused for any agricultural purpose.

may merely be stated that after each of the essential principles was clearly understood special methods for rooting blueberry cuttings were perfected without serious difficulty and are now in practical operation in the field.

Reference has already been made to the breeding experiments aimed at the production of new and superior varieties of blueberries. In the course of these experiments one fact turned up which merits comment here, because to its curious interest is added its great practical importance in the actual field culture of the blueberry.

An attempt was made to ascertain whether an especially fine blueberry variety could not be made to come true from the seed by pollinating flowers of the individual plant with its own pollen, just as has commonly been done in the breeding of choice varieties of vegetables. From these self-pollinations, however, few berries and seeds were secured.

In all cases, although the pollinations were made very carefully by hand, the

berries that resulted from self-pollination were smaller and later in maturing than cross-pollinated berries on the same bush. On some bushes not a berry matured from many self-pollinations. The same relation exists between the flowers of two plants grown from cuttings of the same bush. These plants behave like different parts of one plant and set little or no fruit from each other's pollen.

From these experiments it became clear that if a blueberry grower should set out a whole field with plants from cuttings of a single choice bush his plantation would be practically fruitless, because it would contain no other blueberry stock from which the bees in their search for nectar could bring the unrelated pollen required to enable his choice plants to set fruit. The best procedure is to make up the plantation with alternating rows of plants propagated by cuttings from two choice varieties. Each will then set fruit in abundance through pollination by the other (see page 544).

The introduction of the blueberry into agriculture has a much more profound significance than the mere addition of one more agricultural industry to those already in existence. Blueberries thrive best in soils so acid as to be considered worthless for ordinary agricultural purposes. Their culture, therefore, not only promises to add to the general welfare through the utilization of land almost valueless otherwise, but it offers a profitable industry to individual landowners in districts in which general agricultural conditions are especially hard and unpromising, and it suggests the possibility of the further utilization of such lands by means of other crops adapted to acid conditions.

AMERICA'S SURPASSING FISHERIES

Their Present Condition and Future Prospects, and How the Federal Government Fosters Them

By Hugh M. Smith

United States Commissioner of Fisheries

THE early history of France, Spain, Portugal, and England in the New World is to a very considerable extent centered in the fisheries. The tales of fabulous quantities of cod, herring, etc., brought back by the European navigators to the western shores of the Atlantic were the principal single inducement or incitement to further voyages of adventure and discovery; and the verification of these tales was a potent factor in subsequent colonization.

A cod fishery about Newfoundland was conducted by Normans and Bretons as early as 1504, and there is a tradition among the fishermen of the Bay of Biscay that one of their number who had been fishing in the western Atlantic informed Columbus of the existence of land in that region before the illustrious explorer had begun his memorable voyages.

A very able American writer on the early fisheries of the country makes a plausible case in favor of his contention that the Pilgrims could not have escaped the fishing mania which affected all other people of maritime Europe at the time, and that these weary exiles in Holland, noting the riches acquired by the Dutch from their fisheries, could not have been unmoved by the accounts of the vast shoals of fish to be found on the shores of the New World.

The settlement of Massachusetts colony was due directly to the fisheries, and the original proprietors of New Hampshire went there for the sole purpose of

acquiring wealth by fishing and trading. The first articles exported from New England were fish, and the commerce and navigation of that section were founded on fish. Most of the conflicts between the English and French colonies, which continued for 150 years and terminated on the Plains of Abraham, grew out of or involved disputes over the fisheries.

With the extension of our country, new aquatic wealth was found and utilized, contributing materially to early development and subsequent prosperity; particularly noteworthy were the oyster beds and river fishes of the Middle and South Atlantic States, the whitefish and other food fishes of the Great Lakes, and the salmons of the Pacific States.

With the acquisition of Alaska there came to us marine resources of such transcendent value as to overshadow all other natural products and to give the United States fisheries the leading place among the nations.

The creatures which support our fisheries are not all fish, but belong in various classes, some of those contributing most notably to the importance of the industry being crustaceans and mollusks. In a total annual value at the present time of approximately $76,000,000, the relative and actual importance of the different groups is shown in the accompanying diagram.

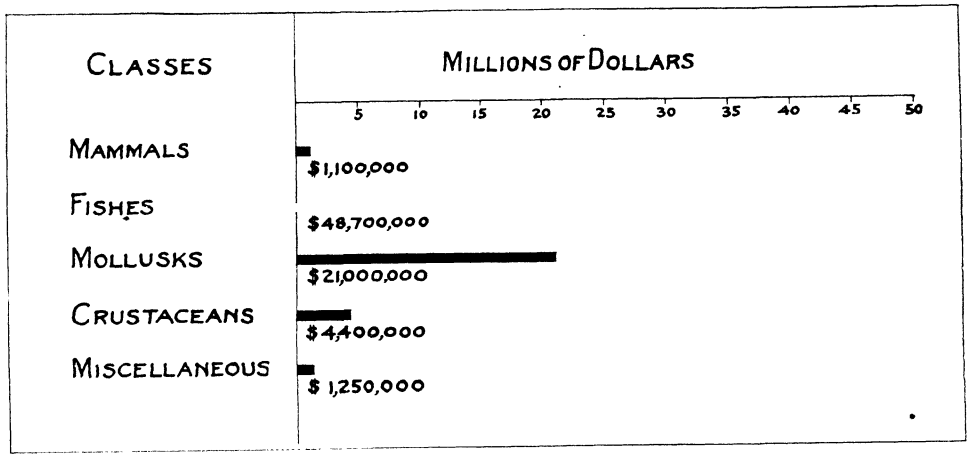


ILLUSTRATION OF THE ANNUAL VALUE OF AMERICA'S FISHERIES

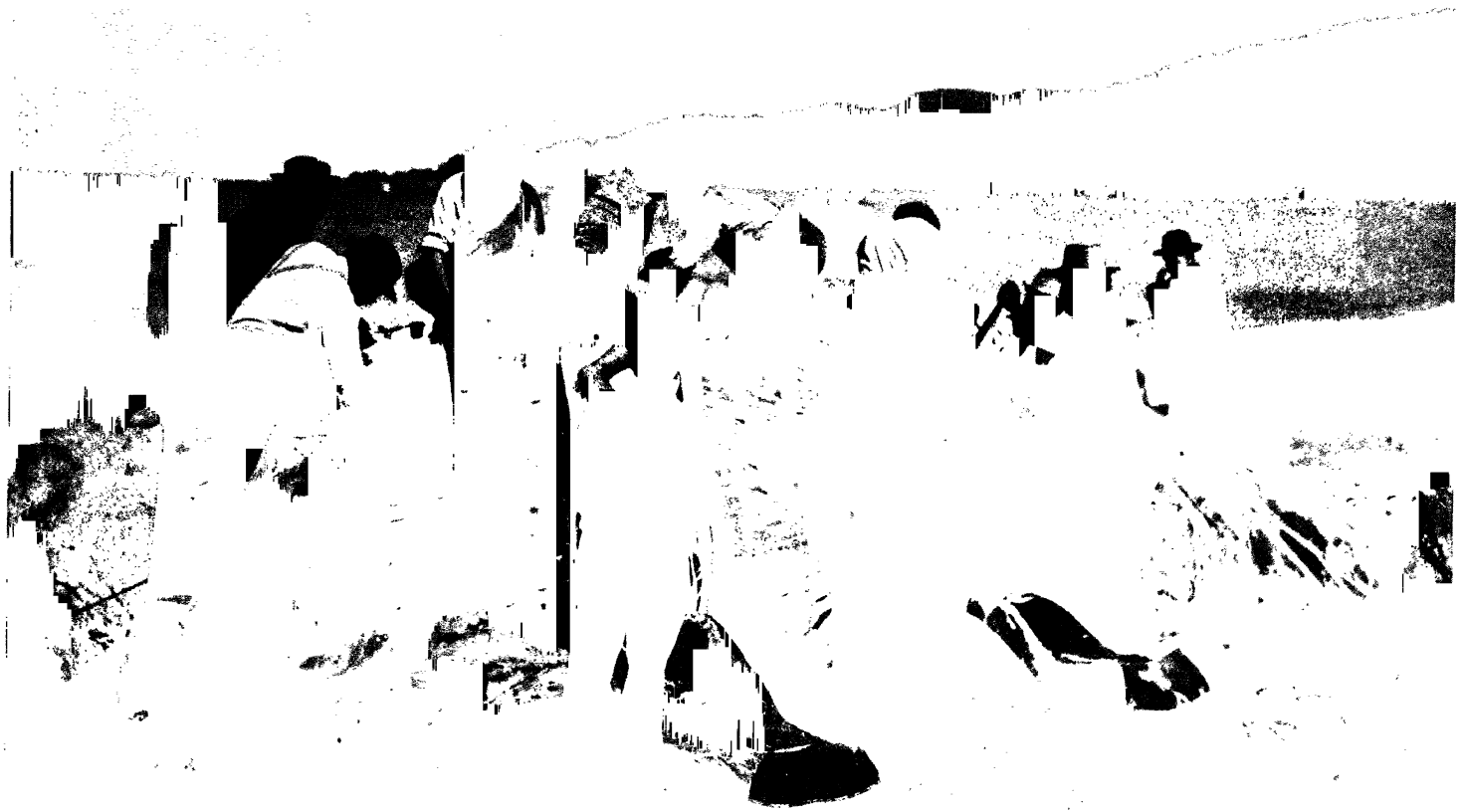
The oyster industry accounts for the principal value of the mollusk fisheries, while the lobsters and crabs constitute the principal part of the crustacean catch. Seals and whales contribute the bulk of the returns of the mammal fisheries.

THE VANISHING WHALES

Most prominent among the aquatic mammals are various kinds of whales and the Alaskan fur seal. At the outbreak of the American Revolution and for a period of 75 years following the conclusion of that struggle, whaling was the most important branch of the American fisheries. From 500 to 700 vessels sought whales in all the oceans and seas of the world, and in one year New Bedford alone sent out 300 vessels, whose cargoes of bone and oil were the basis of the industrial life of the city.

The pursuit of sperm whales reached its climax in 1837, when oil valued at nearly four and a half million dollars was brought in, mostly from the South Pacific. The height of the industry was in 1846, when 70,000 persons derived their support from whales, and 720 vessels, valued at $21,000,000, were engaged.

For more than fifty years the fishery has been declining, and in numerous ports that once derived most of their wealth from the industry there have for a long time existed only memories of former greatness. For a number of years the



Photograph and copyright by Asahel Curtis

INDIANS STRIPPING THEIR PREY AT NEAH BAY: WASHINGTON

Whenever the coastal Indians kill a whale, they have a feast, literally gorging themselves with the flesh, blubber, and other parts

sperm, right, and bow-head whales that supported the fishery in early years have been very scarce and their pursuit has been unprofitable; and the present importance of the whale fishery, amounting in value to less than 2 per cent of the American fisheries, depends on the taking from shore stations of species of whales that formerly were for the most part neglected.

The glory of the whale fishery has departed forever, and the commercial, if not the biological, extinction of all kinds of whales is proceeding rapidly, undeterred and unlamented by the principal maritime powers.

THE ALASKAN SEAL HERD RESTORED

The Bureau of Fisheries is the official custodian of the most valuable herd of animals that any government of the world possesses. This is the herd of fur seals which roam over the eastern side of the north Pacific Ocean and return for breeding purposes to the Pribilof* Islands. After being sadly decimated by indiscriminate slaughter at sea, the herd has been rapidly recuperating under the influence of an international agreement, and soon the fur seals may be as numerous as when they came into the possession of the United States Government with the purchase of Alaska.

The fact that the only land to which these animals ever resort is two islets in Bering Sea belonging to the United States gives our government a claim to possession such as is exercised over no other wild creatures of water, land, or air. This governmental ownership or jurisdiction is the only reason why the fur seal has not long ago succumbed to the fate that is rapidly overtaking all the other large marine animals.

In the summer of 1916 more than 100,000 young seals will have been added to the Alaskan seal herd, whose total strength will then be upward of 400,000 individuals of all classes. For some years only a limited number of seals have been utilized for the food purposes of the natives; but after the present close-time law expires, in 1917, there will be available for commercial use many young male seals, which add nothing to the reproductive capacity of the herd and may properly be utilized for their skins and other products.

In fact, the seal herd may be managed after the manner of a herd of cattle or sheep, and if handled in a strictly scientific way will add to the Federal treasury a very handsome revenue, which will increase yearly as long as the existing international arrangement continues.

Meanwhile a revolution will have occurred in the world's fur-seal trade, for the Department of Commerce has changed the old order of things, and, for the first time, this American product, belonging to the American public and most largely used by American women, will be sold in an American market, instead of being sent abroad for sale; and the peculiar dressing and dyeing process, which is necessary to bring out the beautiful qualities of the Alaskan sealskin, will likewise have been brought from abroad and established in America.

THE ASTONISHING FISH LIFE OF OUR COASTAL AND INTERIOR WATERS

To give a mere list of the American fresh-water and salt-water fishes which support important industries would require several printed pages, for there are few, if any, countries that can boast of a larger variety of highly valuable fishes.

Every person familiar with the north Atlantic coast will recall the prominent place occupied by the cod, haddock, hake, pollock, halibut, mackerel, bluefish, herring, squeteague, sea-bass, scup, and swordfish, all of which are staple foods. On the south Atlantic seaboard the major food fishes are the mullet, croaker, spot, Spanish mackerel, in addition to the bluefish and squeteague. In the Gulf of Mexico the mullet and red snapper hold front rank among a host of excellent species. The Pacific coast supports a great profusion of flounders and rockfishes, and, to the northward, cod, halibut, and herring in extraordinary abundance.

The migratory fishes of our seaboard streams are not equaled in abundance,

* See "Making the Fur Seal Abundant," by Hugh M. Smith, in the NATIONAL GEOGRAPHIC MAGAZINE for December, 1911.



Photograph from U. S. Bureau of Fisheries

A HERD OF ALASKAN FUR-SEAL

After being sadly disseminated by indiscriminate slaughter at sea, the herd has been rapidly recuperating under the influence of an international agreement, and soon the fur-seals may be as numerous as when they came into the possession of the United States Government with the purchase of Alaska (see text, page 549).

variety, and excellence anywhere else in the world. They include the shad, alewives, smelt, striped bass, and perches of the Atlantic slope, and the salmons of the Pacific. The latter have been supplemented by the shad and striped bass, introduced from the east and now among the most abundant of the river fishes of the Pacific States.

Among the important strictly freshwater fishes, first place must be given to the trout, whitefish, herrings, and pike perch of the Great Lakes, and to the basses, catfishes, buffalo-fishes, suckers, and carp of the interior waters generally. The last-named fish, introduced into Europe from Asia some centuries ago and brought to America from Europe about 1876, has become the most widely distributed, most abundant, and most important single fish of the fresh waters of America.

MOST ABUNDANT ECONOMIC FISH OF ATLANTIC SEABOARD

The most numerous fish of economic importance on the east coast of the United States is the menhaden, which is known also by a large number of other names, some of them inappropriate and misleading. It is a member of the herring family; goes in great schools in the ocean, bays, and sounds, and supports a fishery from Maine to Florida.

Although the menhaden is a palatable food fish, its principal value now, as in the past, is for conversion into oil and fertilizer. At times it is exceedingly fat, and yields a cheap grade of oil much used in the industries, while the part remaining after the extraction of the oil is rich in ammonia and is one of the best fertilizers, whether employed alone or in combination with other ingredients.

The great abundance of the menhaden, its wide distribution on our coast, and its peculiar properties led many years ago to the establishment of an industry which soon became, and continues to be, one of the leading branches of the fisheries. In addition to the major uses referred to, large quantities are utilized as bait in the line fisheries for cod, mackerel, bluefish, and other fishes, and insignificant numbers are used as human food.

The chief purpose, however, which the menhaden serves is as food for numerous valuable fishes along the entire coast. It forms at times the principal diet of bluefish, swordfish, squeteague, bonito, mackerel, Spanish mackerel, etc., and often when we eat these fishes we are really consuming transformed menhaden. The abundance or scarcity of menhaden in a given season or on a given part of the coast may determine the abundance or scarcity of various important food fishes; and for this reason, in addition to its immediate value to man, it has by some persons been regarded as the most important fish on the Atlantic coast of the United States.

For many years the menhaden fishery has been the subject of much discussion and local opposition. In the opinion of many people, the catching of enormous numbers each year by means of purse seines has a tendency to make scarce the fishes which prey on the menhaden, and thus injury is done to other fisheries, particularly those carried on with lines by professional fishermen and sportsmen.

It is impossible to discuss this important question properly within reasonable space limits, and it will suffice to state that while the quantities of menhaden caught by man are insignificant by comparison with those consumed by other animals; while it may be unsafe to ascribe the scarcity of any food fish in a given year or locality to the effects of the menhaden fishery, inasmuch as some of our most important fishes are known to have exhibited periods of scarcity before the menhaden fishery was inaugurated, and while it is improbable that the operations of the fishermen have had any permanent influence on the abundance of the menhaden, nevertheless there is reason to believe that the presence of desirable food fishes in certain waters may be materially affected by the capture therein of large quantities of menhaden, and the fishery for the latter species should therefore be subject to Federal or State legislation.

Some idea of the abundance of menhaden and the magnitude of the fishery may be gathered from the fact that in 1913, when the Bureau of Fisheries made a special investigation and a statistical



GOVERNMENT SPAWN-TAKERS AMONG THE GLOUCESTER, MASSACHUSETTS, COD FISHERMEN

A very trying life, full of danger and exposure. At the Gloucester hatchery many hundred million eggs of cod and other valuable commercial food fishes are taken every year from fish that have been caught for market and whose eggs would be entirely lost except for the operations of the Bureau of Fisheries.

canvass of the industry, more than one billion fish were caught and converted into over six and a half million gallons of oil and nearly ninety thousand tons of fertilizer, valued at three and a half million dollars. These fish, if placed end to end, would have extended in an unbroken line six times around the earth at the Equator, and their weight exceeded that of all the inhabitants of Greater New York.

OUR UNSURPASSED SHELL-FISHES

There is no stretch of coast along the many thousand miles of shoreline of our mainland and islands, from Passamaquoddy Bay to the Rio Grande and from the Mexican boundary to the Gulf of Georgia, including all bays, sounds, and estuaries, that does not support some form of valuable crustacean or mollusk. Among the most prominent are the lobster of the North Atlantic coast, the spiny lobsters of Florida and California, the small blue crab of the Middle and South Atlantic and Gulf waters, the great crabs of the Pacific States and the shrimp and prawn of the Gulf of Mexico and California.

By far the most valuable of these is the lobster, which supports a fishery from Maine to Delaware and is the principal means of livelihood in many New England communities. For many years the fishery has presented the striking anomaly of an annually declining output and an annually increasing income to the fisherman. In the past quarter of a century the catch has decreased over 60 per cent, while the receipts of the fishermen have increased 200 per cent. The lobster, which because of its nutritious character



A GOVERNMENT SPAWN-GATHERER AT WORK ON A GLOUCESTER FISHING SMACK

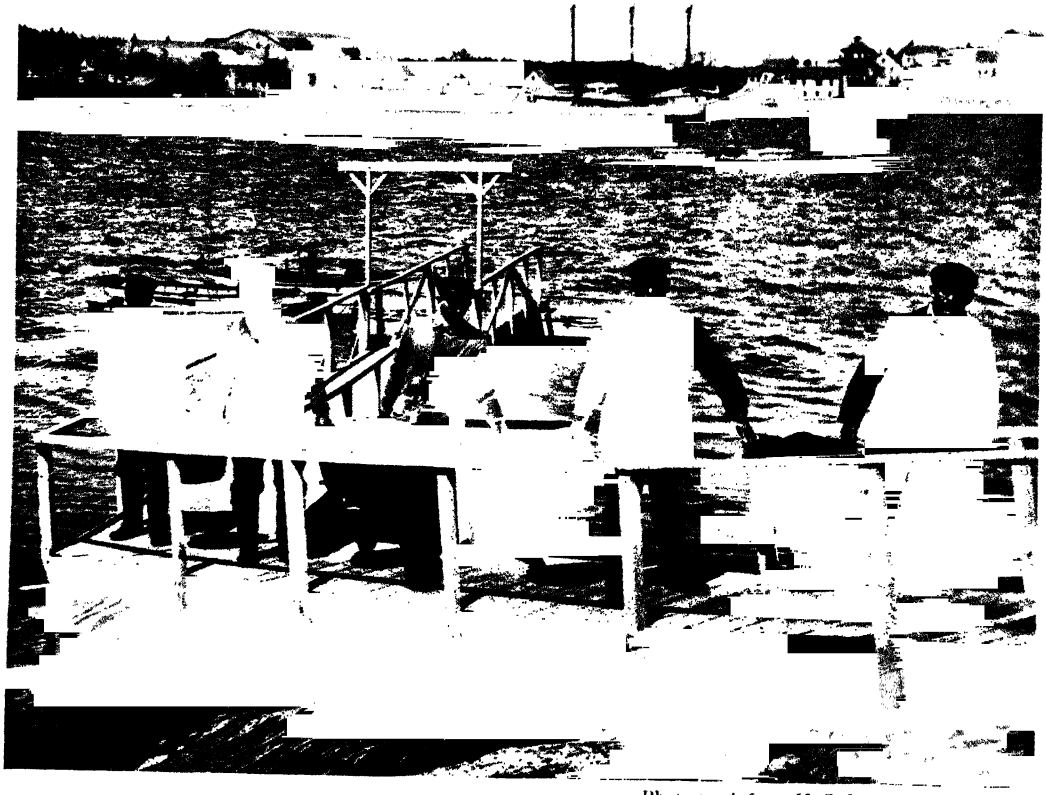
While most of the spawn used in government cod propagation comes from fish kept for breeding purposes, this has to be supplemented by that gathered from fish caught by the commercial fishermen.

should be a staple food, has for years been a luxury, and every season the price to the retail consumer becomes more prohibitive.

The reasons for the diminishing supply are well known and may be summed up in a few words: disregard for the future, neglect of natural laws, and indiscriminate fishing. The situation demands radical action on the part of the States, and the welfare of the general public must be placed ahead of the temporary gain of fishermen.

The mollusks which figure most prominently in the fisheries and enter most largely into our dietary are the hard-shell clam, or quahog, known as the "little neck" when young; the soft-shell clam, or maninose, extensively used as bait in the New England line fisheries, in addition to being a highly prized food; the small and the giant scallops; the sea-mussel; the abalone, peculiar to the Pacific coast and more valuable for its brilliantly colored nacre than as an article of diet for occidentals; the squids, eaten by Asiatics and by the people of southern Europe, but used mostly for bait in line fishing, and, most important of all, the oysters of the eastern and western seaboards.

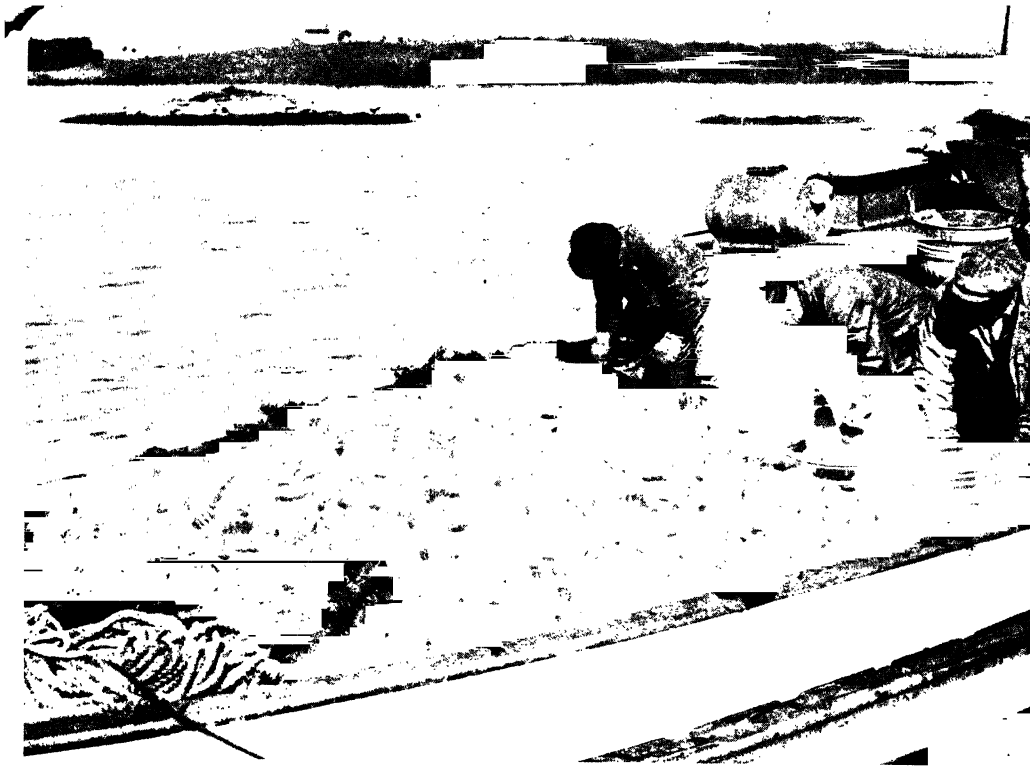
Throughout a vast area in the interior of the country there occur numerous species of mussels, or fresh-water clams, which have no utility as food, but because of their pearly nacre are in great demand for their shells. A very extensive industry, of comparatively recent origin in the United States, is based on the utilization of these shells for making buttons (see p. 563). These same mussels produce the only valuable pearls found in our waters.



Photograph from U. S. Bureau of Fisheries

SAVING THE NEW ENGLAND LOBSTER FISHERY

These men are bringing egg-bearing lobsters to the hatchery at Boothbay Harbor, Maine. The Bureau of Fisheries, in coöperation with the State authorities, collects egg-bearing lobsters from the fishermen, takes the lobsters to the hatcheries, and saves all the eggs, which would otherwise be lost. The mother lobster carries her eggs externally for ten months, and if caught at any time during that period her entire progeny is sacrificed unless her eggs are safeguarded by the lobster culturist. The lobster's eggs are about one-eighth of an inch in diameter and from 10,000 to 15,000 are produced by an average lobster.



A LOAD OF EGG-BEARING LOBSTERS

These lobsters have been collected from the fishermen and are being taken to the hatchery, where their eggs will be removed by gentle scraping with a dull knife

AMERICA PREËMINENT IN OYSTER PRODUCTION*

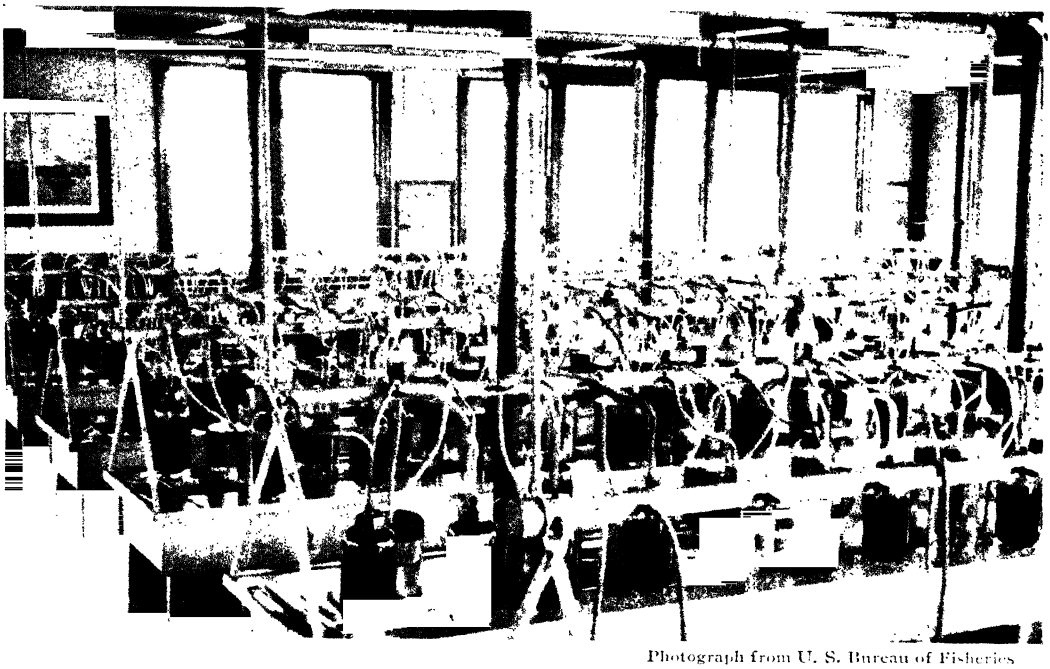
Among the fishery products in which America is preëminent, the most conspicuous is the oyster. This, our most important aquatic resource, is not only more valuable than in any other country, but more valuable than in all other countries combined.

The American oyster has the further distinction of being a staple food of comparatively low price, while in practically every other country having a well-developed oyster industry the oyster is a high-priced luxury. Its commanding position is shown in the facts that it is a commercial commodity in every coastwise State except two (Maine and New Hampshire); that it is the leading fishery product in fifteen States, and that it is the most extensively cultivated of all our aquatic animals. The annual oyster crop of the United States is about 35,000,000 bushels.

The yield is increasing yearly, and in some States is capable of great expansion, while in a few States the limit of production has nearly been reached. The seven leading oyster States are Rhode Island, Connecticut, New York, New Jersey, Maryland, Virginia, and Louisiana. Virginia and Maryland have the largest output, while New York and Connecticut have the largest money returns. The body of water which produces more oysters than any other in the United States, or, in fact, the world, is Chesapeake Bay. Other important regions are Narragansett Bay, Long Island Sound, New York Bay, and Delaware Bay.

The early rank taken by our oysters,

* See "Oysters—the World's Most Valuable Water Crop," by Hugh M. Smith, NATIONAL GEOGRAPHIC MAGAZINE, March, 1913.



Photograph from U. S. Bureau of Fisheries

TWO HUNDRED MILLION LOBSTER EGGS INCUBATING IN THE AUTOMATIC HATCHING JARS AT A NEW ENGLAND LOBSTER STATION OF THE U. S. BUREAU OF FISHERIES

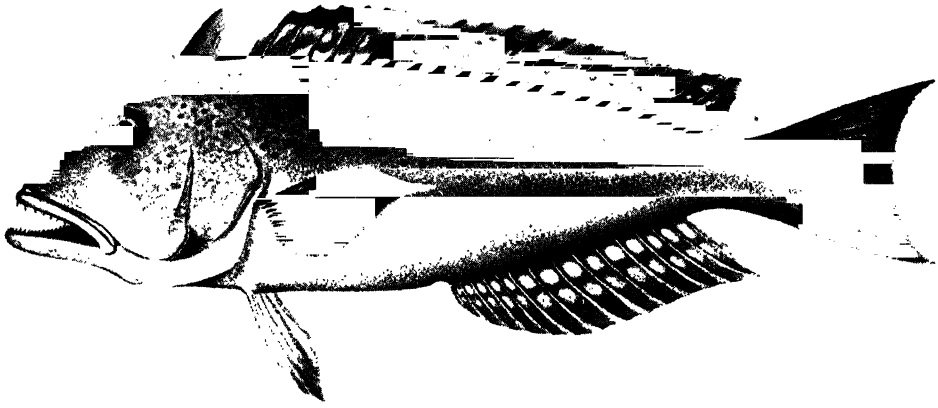
aside from their excellent flavor and large size, was due chiefly to the vast area of the oyster beds. The maintenance of that rank, however, has depended on oyster culture. Whenever the oyster fishery has been active, the necessity for artificial measures to maintain the supply has sooner or later become obvious, and at present about half a million acres of bottoms covered by salt or brackish water are being cultivated as oyster farms.

Although about 50 per cent of the quantity and 70 per cent of the value of our annual oyster crop are derived from planted grounds, and such product is larger than in all the remainder of the world, it is a significant fact that in no other important oyster-producing country is so large a proportion of the oyster output derived from natural beds.

Some of the States have only slowly appreciated the advantages that accrue from oyster farming and have been loath to abandon principles of oyster management that long since became obsolete. The welfare of their oyster industry has thus been greatly impaired, while more progressive States have reaped large benefits from the general adoption and encouragement of private oyster planting instead of continuing to depend on the diminishing output of depleted natural beds.

Oyster culture as practiced in America consists essentially of the following features: (1) Acquiring from the State, by lease or purchase, suitable submerged bottom; (2) cleaning and otherwise preparing that bottom, if necessary, for the growth of oysters; (3) sowing thereon oyster shells or other similar material, technically known as "cultch," for the attachment of the young oysters; (4) insuring the set of "spat," or larval oysters, by having adult oysters on contiguous bottom; (5) protecting the beds from starfishes, drills, and other natural enemies; (6) transplanting the oysters to prevent overcrowding and to facilitate growth and fattening, and (7) culling and sorting for market.

The United States Government, through the Bureau of Fisheries, while exercising



THE "TILEFISH," LATELY INTRODUCED TO THE AMERICAN DINNER TABLE

The tilefish first came to the attention of science in 1879. Three years later the Gulf Stream, with its warm water, drifted off of the continental shelf in tilefish territory, with the result that perhaps a billion and a half members of the species died, literal victims of a cold wave (see text, page 570).

no jurisdiction over the oyster grounds, has done much to promote the industry. The assistance rendered has taken various forms and has included studies of the oyster's life history, on the accurate knowledge of which protection and cultivation must depend; surveys of grounds on which oyster planting may be conducted, thus increasing the output and at the same time affording a larger revenue to the States from the sale or lease of such grounds to prospective farmers; experimental and model planting operations, often in regions where no oyster culture was previously conducted; recommendations for oyster legislation, and disinterested expert advice on the various problems that arise in the administration and practical conduct of the oyster industry.

ALASKA'S ENORMOUS FISHERY WEALTH

The salmon resources of the Pacific States are among the natural wonders of the Western Hemisphere, but they now take rank after those of Alaska, whose fisheries as a whole have experienced their remarkable development and attained their present surpassing importance chiefly because of the salmons.

Since Alaska became a part of the national domain, the total value of the products taken from the waters of the territory up to the present year has been nearly $300,000,000; the fishery reached its climax in 1915, with a value of $21,000,000, which is three times the purchase price of Alaska. Included in the foregoing aggregate are the very considerable sums accruing from the fur seal; but the bulk of the output represents the salmons, with cod, halibut, and herring completing the list of important fishes.

The halibut fishery of Alaska is far more productive than the halibut fishery of the Atlantic coast ever was, even in its palmy days; and it, with the fisheries for cod and herring, is capable of much further development.

The weight of the salmons taken in Alaska in 1915 was about 400,000,000 pounds. If this catch could have been placed in barrels holding 200 pounds each and the barrels piled end on end, the height of the column would have been about 1,200 miles! Or if the catch had been loaded into ordinary freight cars, a train of 10,000 cars would have been required and the length of the train would have exceeded 100 miles!



Photograph and copyright by Detroit Publishing Co.

A FLAKE YARD: GLOUCESTER, MASSACHUSETTS

Salted cod and other ocean fishes are fully cured by drying in the open air, and are then converted into "boneless" fish in numerous establishments on the water front of this old town

PLANTING THE WATERS

To compensate for the vast quantities of food fish taken annually from the coastal and interior waters of the country, the Federal Government conducts very extensive operations in artificial propagation, coöperating with the various States which are engaged in similar work or acting alone in the many States which have no hatcheries of their own. The States which maintain fish hatcheries number about twenty.

The year ending on June 30, 1916, was the most successful in the history of government fish culture in America. About five billion food and game fishes were brought into being under Federal auspices and distributed where they would do the most good. So comprehensive and well organized has this work become that the egg-collecting and hatching operations were conducted in 32 States and Alaska, and the output reached the waters of every State and Alaska.

The major fish-cultural efforts are directed to the cod, haddock, pollock, flounder, and lobster of the New England coast; to the salmon, shad, striped bass, white perch, and yellow perch of the streams of the Atlantic seaboard; to the whitefish, trout, and pike perch of the Great Lakes; to the salmons of the Pacific streams, and to the numerous trouts, basses, and other food and game species of the interior waters.

Distributions in public waters are made on the initiative of the government or on the recommendation of the State authorities; but the fishes adapted for ponds, smaller lakes, and minor streams are for the most part consigned on individual applications and are supplied without cost.

In moving the hatchery output to the points of deposit, specially constructed railway cars, with expert crews, are required, and in 1915 about 640,000 miles of railway travel by cars and detached messengers was needed for the distribution.

The fish-cultural work is so popular throughout the country, and the demand for fish for stocking public and private waters is so great, that new hatcheries are established by Congress from time to time, and a bill recently reported favorably to the House of Representatives provides for eighteen additional hatcheries to enable the Bureau of Fisheries to increase its operations in old fields and to extend its activities into new territory.

RESCUE OF FISHES FROM OVERFLOWED LANDS

An important adjunct and outgrowth of the hatchery operations is the rescue of fishes from the flooded lands in the valleys of the Mississippi and some of its tributaries. When these rivers overflow their banks and extend into the adjacent cultivated and waste places, as they do every year, they carry with them all kinds of food fishes. When the floods begin to recede, many of the older fishes find their way back to the streams; but enormous numbers of mature and young fish are left in sloughs, pools, or ponds, which gradually become dry, and the death of all the contained fishes follows as a matter of course; or, if the floods come late in the season and the stranded fishes do not perish from evaporation and seepage of the water, the same result ensues when the shallow pools become covered with ice.

This inviting and important field is entered by the Bureau of Fisheries with numerous crews of fishermen equipped with seines for catching the fish and with receptacles for holding them until they are returned to the parent streams or supplied to applicants in the contiguous territory. The rescue operations are conducted from Minnesota to Mississippi, and the food and game fishes saved every year run far into the millions.

HOW SCIENCE AIDS THE FISHING INDUSTRY

The general public is often restive and sometimes captious when any Federal bureau engages in scientific work to which there is no direct and obvious practical application or from which immediate economic results do not inevitably come. This attitude is reflected upon and responded to by members of Congress, so that it is usually difficult to secure financial support for the inauguration of scientific investigations or for their contin-



A HARD-SHELL CRAB CONVERTING ITSELF INTO A SOFT-SHELL.

The difference between a hard-shell and soft-shell crab is simply one of time. Every now and then the crab needs to grow a little, so its body gets soft and its hard shell splits open. It is then enabled to pull itself out of that shell and to grow while a new one is in the process of forming. When this process is completed, it ceases to be a soft-shell crab and once more joins the ranks of the hard-shells. This change takes place several times a season.

uance unless some practical outcome is shown or reasonably sure of accomplishment.

Fortunately, the Bureau of Fisheries has from the outset been recognized as an institution whose scientific investigations and experiments lead to important practical ends, and the liberal appropriations for this purpose made by Congress year after year are an evidence of the way in which the lawmakers regard this service.

Our artificial propagation of food fishes, which is the most extensive work of the Federal fishery bureau, has reached its present proportions and efficiency entirely through the application to hatching and rearing methods of biological knowledge of the spawning, development, and general natural history of each of the fishes handled—knowledge that has depended on painstaking, long-continued field investigations.



Photograph and copyright by Keystone View Co.

"PICKING" CRABS FOR MARKET ON THE SHORE OF CHESAPEAKE BAY, MARYLAND

The principal crab fishery of the country is in Chesapeake Bay. In 1915 over 15,000,000 crabs were caught in that body of water and sold by the fishermen for about one million dollars. The picture shows the women "picking" the crab meat.

Feasible methods of cultivating aquatic creatures other than fishes, valuable as food or in the arts and industries, have been developed in order to maintain the supply or to save from commercial extinction. Among the conspicuous achievements under this head have been the perfecting of ways and means of rearing the lobster and the diamond-back terrapin and of growing sponges from cuttings. Especially noteworthy has been the development of the oyster-planting industry, as a result of recommendations to the States following surveys of the oyster grounds and barren bottoms.

One of the large tasks which the bureau has set out to accomplish is the perpetuation of an industry in the Mississippi basin, worth $8,000,000 to $10,000,000 annually, by assuring the permanency



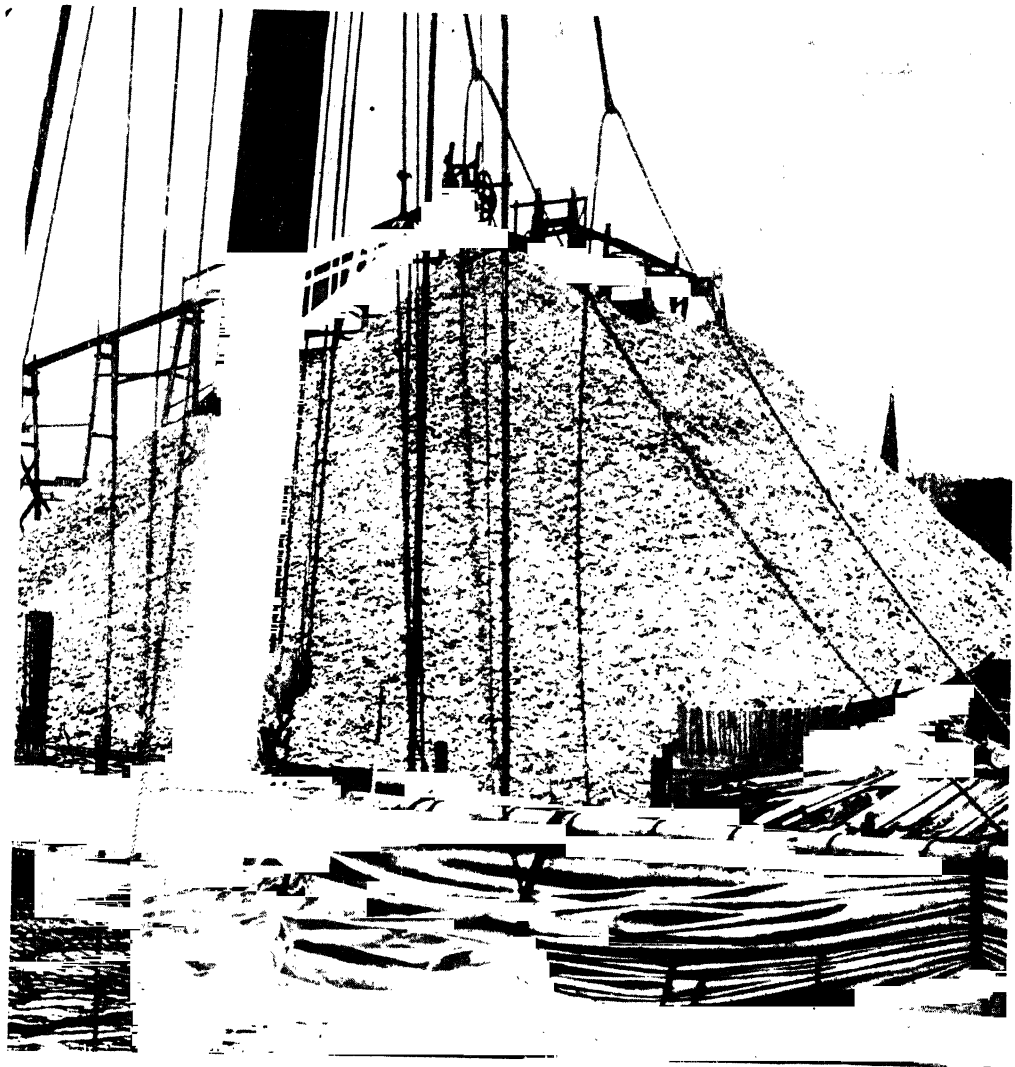
Photograph and copyright by Keystone View Co.

UNLOADING OYSTERS FROM THE HOLD OF A CHESAPEAKE BAY SCHOONER: BALTIMORE

Chesapeake Bay is the leading oyster ground of the world, producing about one-third of the American product, while Baltimore is its foremost oyster market

of the supply of raw materials on which the business depends. A great laboratory has been established on the Mississippi River, at Fairport, in Iowa, and pioneer studies and experiments have there been in progress to determine how the pearly mussels may be artificially increased, so that the many factories making buttons therefrom may not have to shut down following the exhaustion of the mussel beds by unregulated fishing.

An entirely new problem in aquiculture was here presented, and has now been satisfactorily solved through the discovery of the fact that the young mussels, while still in a microscopic larval stage, must attach themselves to the gills of particular fishes in order to develop, and that unless the fishes for which the different kinds of mussels have a selective affinity are available none of the young will survive.



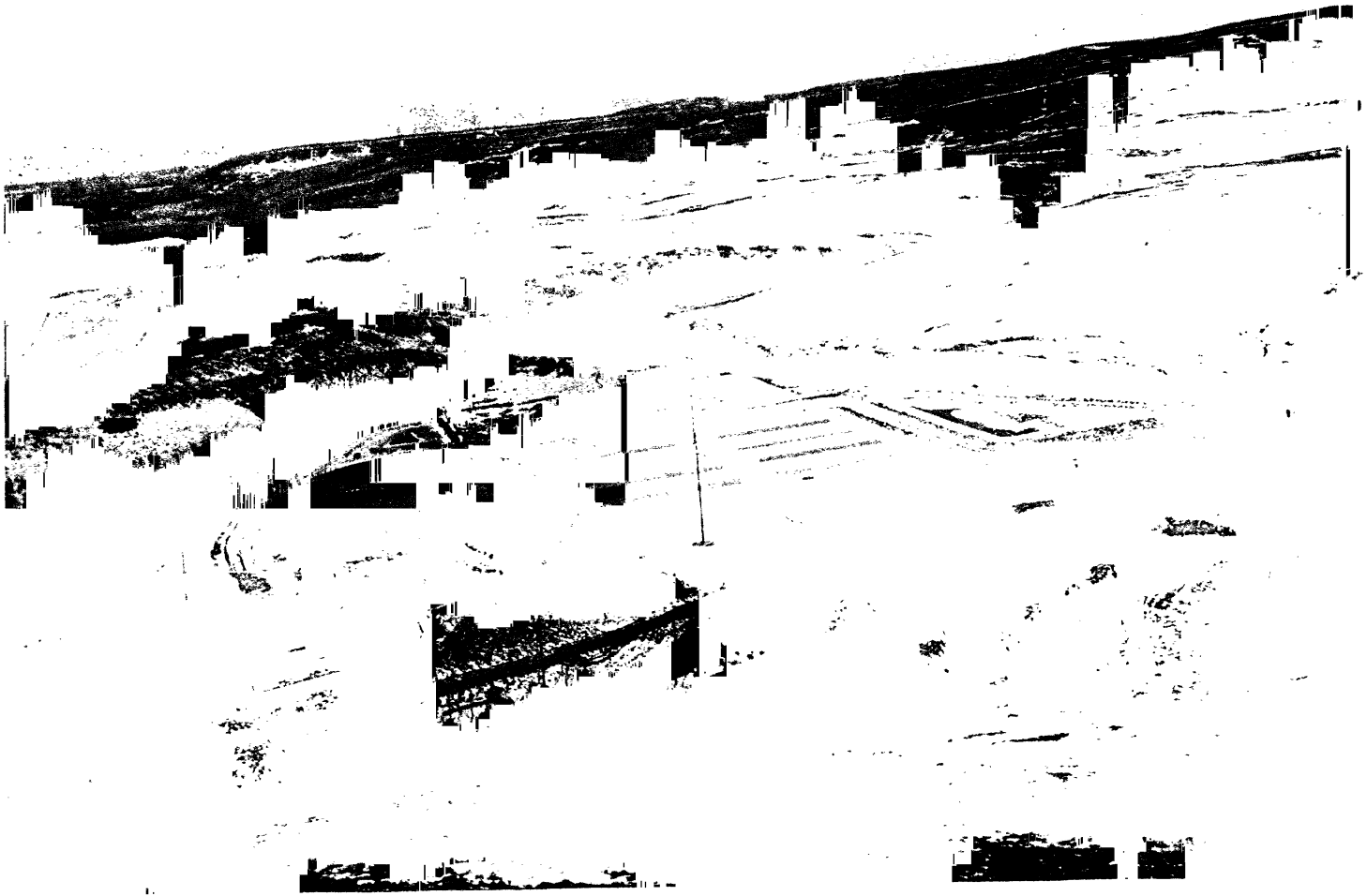
Photograph and copyright by Keystone View Co.

A MOUNTAIN OF OYSTER SHELLS READY FOR PLANTING: OYSTER CULTURE, HAMPTON, VIRGINIA

An essential of oyster farming is to spread on the bottom clear material for the attachment and temporary support of the young oysters. When first hatched, they are free-swimming, microscopic creatures, but in a few hours they fall to the bottom and are lost unless they can adhere to a firm, clean surface while making their shells and undergoing development.

The fish hosts of the various important button-making mussels have been determined, and it is the province of the laboratory to provide those fishes and have them inoculate themselves by swimming in tanks or ponds in which the spawning mussels have been placed.

When a fish is sufficiently infected, it is turned loose in the river, and in a few weeks the young mussels, having attained a proper development, become detached from the gills, fall to the bottom of the stream, and begin their independent existence.

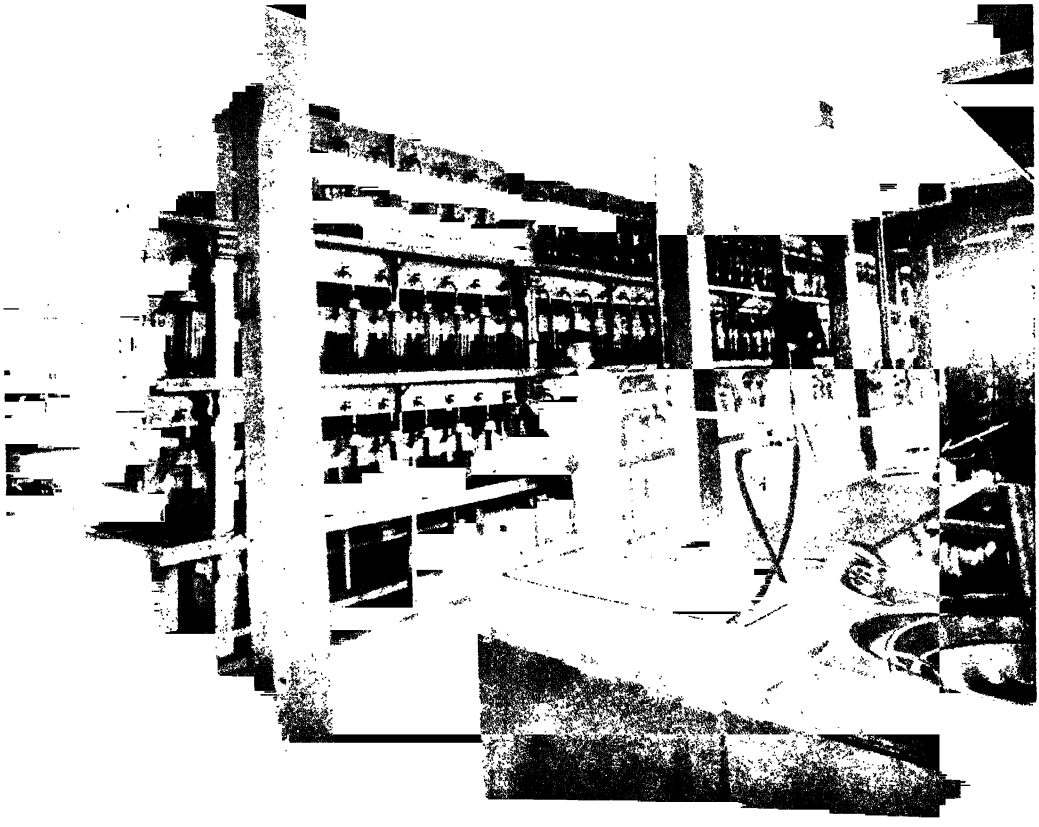


BIRD'S-EYE VIEW OF A GOVERNMENT TROUT AND GRAYLING HATCHERY IN MONTANA



OPEN-AIR TROUGHS FOR REARING ATLANTIC SALMON AT A HATCHERY ON THE PENOBSCOT RIVER, IN MAINE

The Penobscot is the only river on our Atlantic coast which continues to have a regular run of salmon, although in early times many streams were visited annually by schools of this fish. The maintenance of the salmon supply in the Penobscot, notwithstanding adverse physical conditions, is due entirely to artificial propagation.



INTERIOR OF A WHITEFISH HATCHERY, SHOWING PECULIAR ARRANGEMENT OF THE JARS IN A "BATTERY"

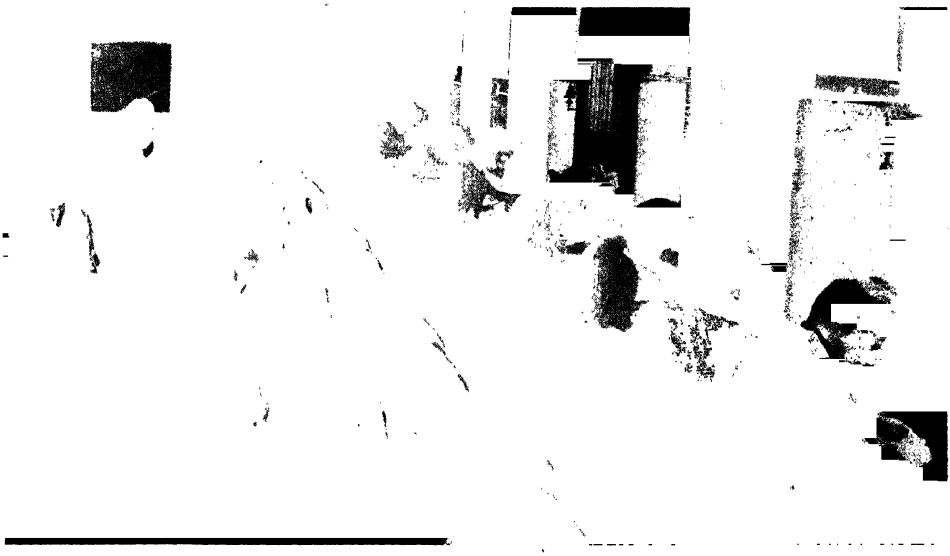
This arrangement economizes space and water and is used throughout the Great Lakes region, where very large numbers of eggs are handled

About 350,000,000 baby mussels were thus inoculated on fishes in 1915 at the Fairport station, and buttons have actually been made from the shells of mussels that had been grown from the larval stage in the laboratory ponds.

FASHIONS IN FISH LIKE FASHIONS IN CLOTHES

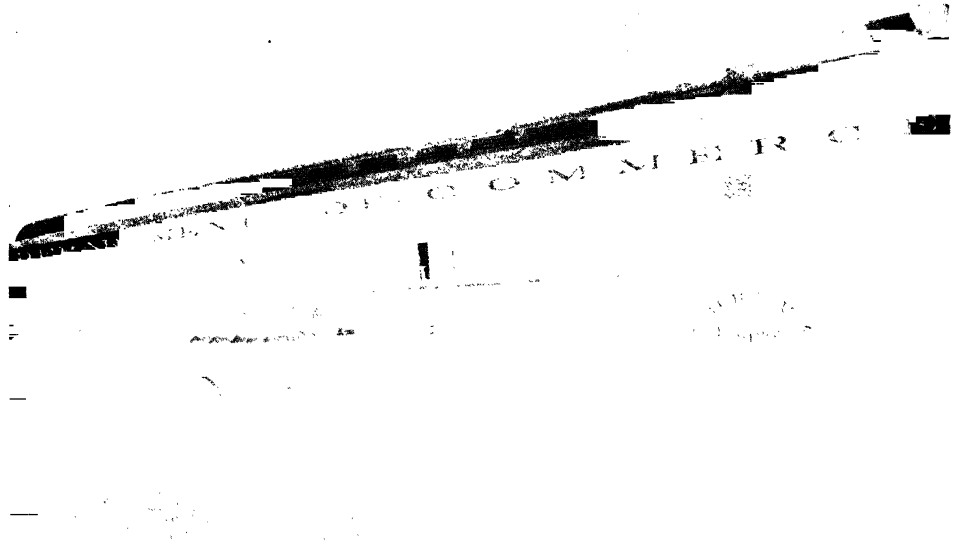
For some years the Bureau of Fisheries has been conducting experiments to show the potential value of aquatic resources that are either wholly neglected or only inadequately utilized in the United States, and has inaugurated several campaigns to induce our people to eat new fish and other water products. This is one of the most important services that can be rendered to a nation, and the success of some of these efforts has encouraged the hope and belief that results of large economic significance may be obtained from various other articles to which fishermen, dealers, and the public are now indifferent.

There are fashions in fish just as there are fashions in clothes. The American public has from the beginning been fastidious and fickle in its tastes for aquatic foods and has been loath to accept articles which other countries long ago adopted as staples.



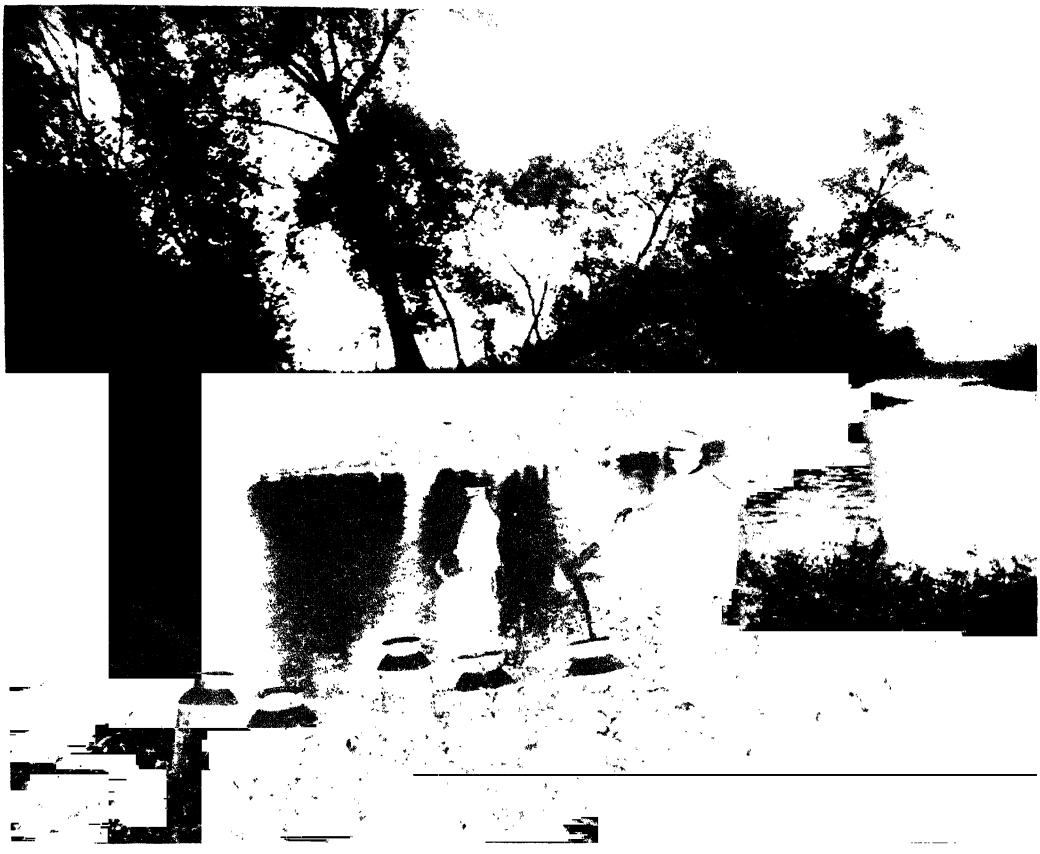
PICKING OUT BAD EGGS IN A MICHIGAN TROUT HATCHERY

Many millions of lake-trout eggs are here incubated, and the trays containing the eggs have to be carefully examined daily in order to remove the dead ones, which, if left in contact with those that are sound, would impair their vitality or communicate disease to them. The "deads" are picked out with tweezers by a body of trained girls temporarily employed for this purpose.



A FISH-DISTRIBUTING CAR BEING LOADED FOR A TRIP

There are more than 6,000,000 farms in the United States. If there were a fish pond on every farm and each family took only three pounds of fish a week, more than a billion pounds of extra food a year would be secured, releasing a corresponding amount of other meat for city consumption, and consequently having a reflex upon the high cost of living.



GOVERNMENT MESSENGERS PLANTING FISH

Before transferring fish from cans to an open stream, it is necessary gradually to bring the water in the cans to the approximate temperature of that in the stream; otherwise the fish will experience a shock.

The great wealth of our waters has made it possible for our people peremptorily to discard much and to choose the best, or what they regarded as the best; and the early development of the fisheries has been characterized by the rejection of wholesome aquatic products that have now taken a prominent place in the market after years or generations of neglect or disrepute. In fact, in every important fishing region people are still living who recall the time when ignorance and prejudice placed a ban on certain aquatic foods which have since become valued commodities in the identical sections where they were formerly condemned or ignored.

Among the well-known examples of water resources that were once wholly or largely neglected, but are now extensively utilized, or are beginning to be more generally appreciated, are the haddock and the winter flounder on the north Atlantic coast; the tunny, the shad, and the minor salmons of the Pacific seaboard, and the sea mussel of New England.

Especially noteworthy has been the recent establishment of a tunny fishery and a very extensive tunny canning industry in southern California. Of the hundreds of thousands of people who now regularly eat the delicious canned "tuna," few realize that a few years ago not a single fish of this species was utilized in America, and that our entire supply came from the Mediterranean.

Another conspicuous case has been the recent development in southern New



PICKING EGGS AT THE GRAND MESA FIELD STATION, COLORADO

The Bureau of Fisheries maintains upward of one hundred field stations, some of the most important being in Colorado. The eastern brook trout, originally introduced into Colorado from New England, is now more successfully propagated there than in any other State, and is being sent back east in large numbers to replenish Atlantic seaboard streams.

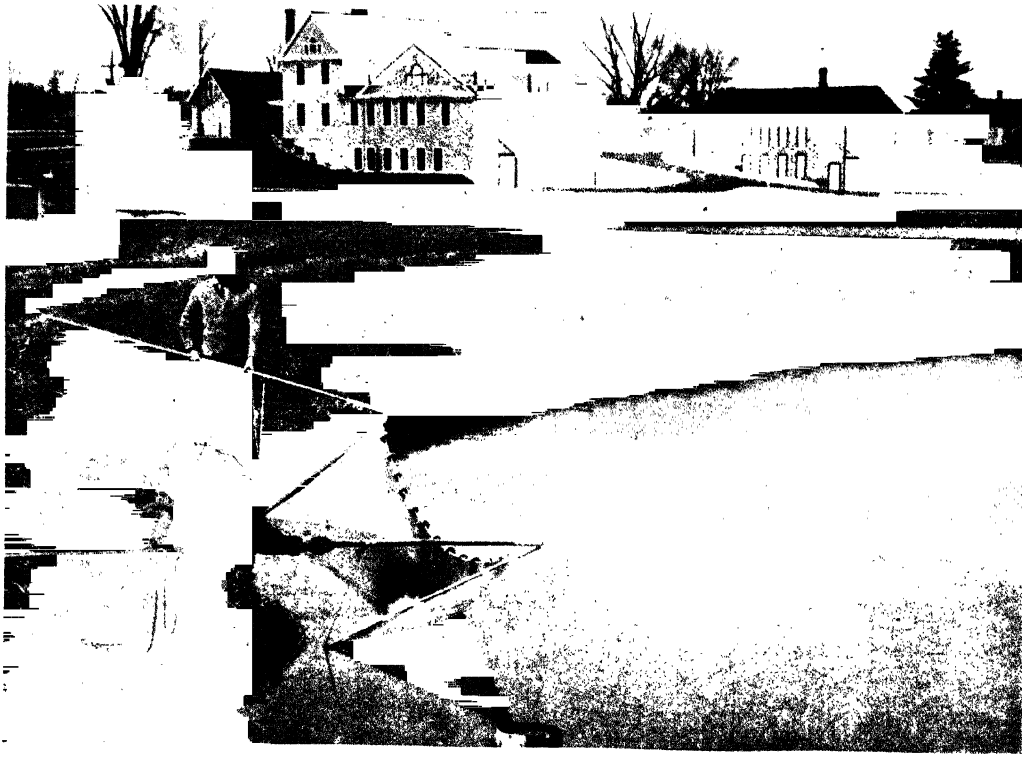
England of a very important fishery for the winter flounder carried on with trawl nets. Formerly only comparatively small quantities of this fish were caught for market, but now millions are taken annually, and thousands of fishermen are making a livelihood in this new fishing industry.

The Bureau of Fisheries long ago called attention to the value of this fish and began its artificial propagation, so that at present, the methods of culture having been perfected, the government is producing a billion or more young flounders each year and planting them in the regions where the fishing is most active.

THE CASE OF THE SEA MUSSEL

A noteworthy case of neglect, followed by appreciation and utilization, is that of the sea mussel, one of the best and most abundant of marine foods. Hundreds of millions of pounds are eaten annually in western Europe, but in the United States practically the only use made of them has been for fertilizer and bait.

In 1914 an advantageous opportunity was presented for introducing this mollusk in one of the prominent Boston hotels, and through the assistance of the newspapers the experiment attracted so much attention that within a few months mussels were, for the first time, being served and given a conspicuous place on the menus of over seventy of the principal hotels, clubs, and restaurants of Boston. The demand naturally spread to private houses and to adjacent communities, with the result that the mussel has become a regular commodity of the



GETTING FISH FOOD FROM A POND AT A MICHIGAN HATCHERY

Young trout and bass subsist naturally on small crustaceans and other living creatures, and the best and hardiest fish are produced when the fish-culturist is able to supply this natural food.

region, to the benefit of consumer, dealer, and fisherman; and the knowledge of the food value of the mussel has gradually extended to other cities, and its regular consumption over a wide area, both adjacent to and remote from the seaboard, is assured.

That a very extensive mussel fishery will be developed on our Atlantic and Pacific coasts is inevitable. Mussels occur in vast beds as yet untouched and easily reached by tongs and dredges. They are as nutritious as oysters and clams, and, their shells being thinner, a given quantity contains more actual food than does the same bulk of oysters.

A further advantage is that they are in season at all times and are at their best on the New England and middle Atlantic coasts when the oyster supplies in the markets are most reduced, namely, in summer.

The most advertised fish in the United States during the past eight months has been the tilefish. The advertising was undertaken by the Bureau of Fisheries in order to make known to the public an abundant, palatable, and neglected food fish occurring on the east coast of the United States in a region readily accessible to the principal markets. The fact that an astonishing amount of interest was thus aroused depended in part on the merits of the propaganda and in part on the romantic and tragic history of the tilefish.

THE ROMANCE OF THE TILEFISH

The tilefish holds an absolutely unique place in nature, science, and industry. So far as records go, no person had ever seen a tilefish prior to May, 1879, when Captain Kirby, fishing in a Gloucester schooner south of Nantucket, caught in deep water several thousand pounds of a



A PACK-TRAIN OF HORSES LADEN WITH CANS OF YOUNG TROUT FOR PLANTING IN A COLORADO LAKE

The jolting of the cans is of advantage to the fish, as it serves to aërate the water

"strange and handsomely colored fish." He sent a specimen to the United States Fish Commission, of which the present Bureau of Fisheries is the direct descendant, and ichthyologists in that establishment discovered it to be new to science and named it *Lopholatilus chamæleonticeps*. A less worthy fish might never have been able to attain popularity under such a handicap name, which, being interpreted, means simply the tufted chameleon-headed tilus. A short name, adapted for common use, was obviously needed, so the sponsors for the new species perpetrated a pun on a syllable of its generic name and called it "tile" fish.

The Commissioner of Fisheries at that time, Prof. Spencer F. Baird, at once began investigations to determine the location and extent of the grounds on which the tilefish occurred, the abundance of the fish, and the possibility of establishing a commercial fishery.

In less than three years, however, and before the plans of the Commissioner were completed, the tilefish met with a cataclysm which resulted in its apparent extermination. News of the disaster was brought in by the master of a ship in March, 1882, who reported that he had sailed for 69 miles through dead and dying tilefish that thickly covered the surface off the middle Atlantic coast.

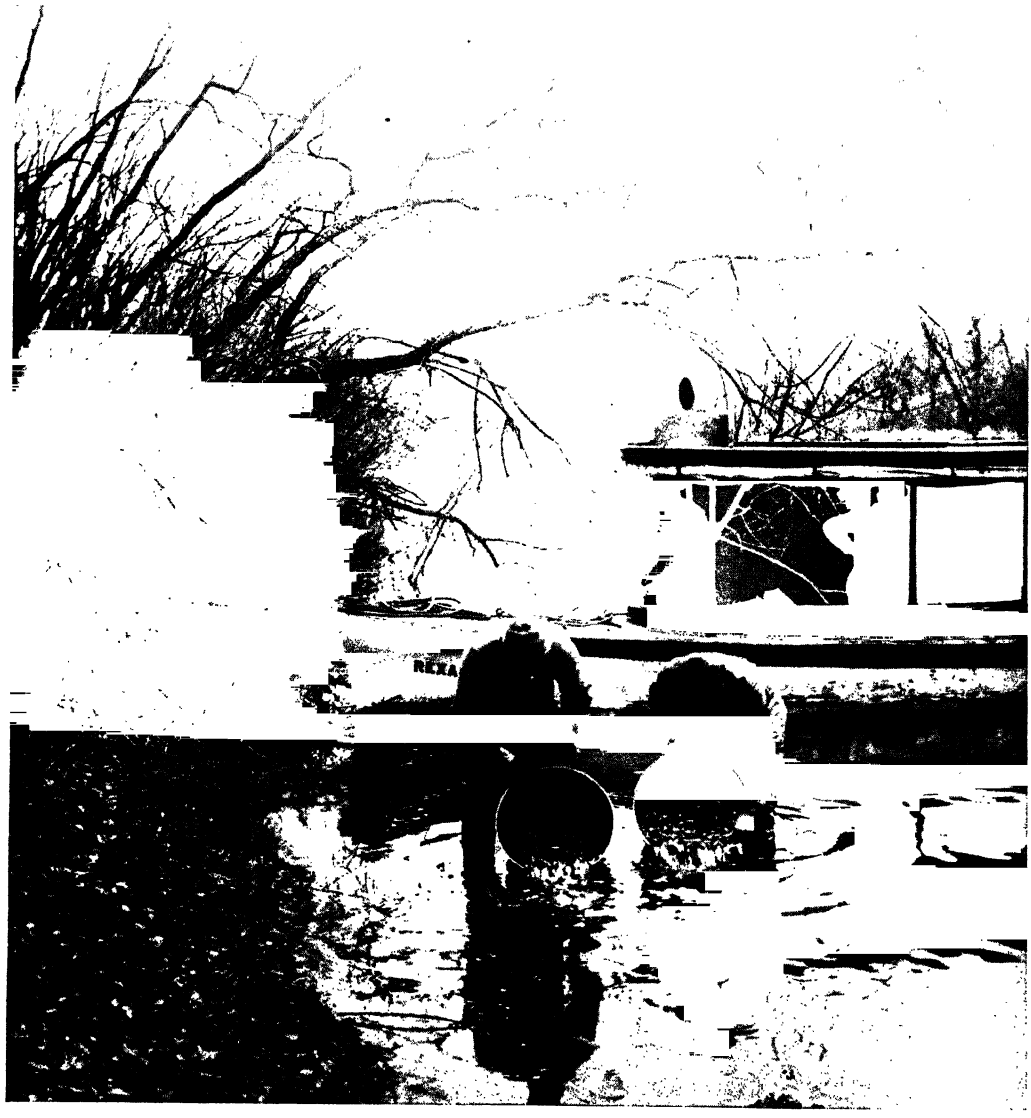
Various other reports to the same effect were received in March and April, and it was computed that an area 170 miles long and 25 miles wide was covered with dead fish, whose number was estimated at 1,400,000,000. No such catastrophe had ever befallen any other fish in the history of the world and speculation as to its cause was rife.

The Bureau, through its investigations before and after the event, was able to offer an explanation which has been generally accepted. The tilefish, while a bot-



RESCUING FISH FROM A MISSISSIPPI RIVER SWAMP

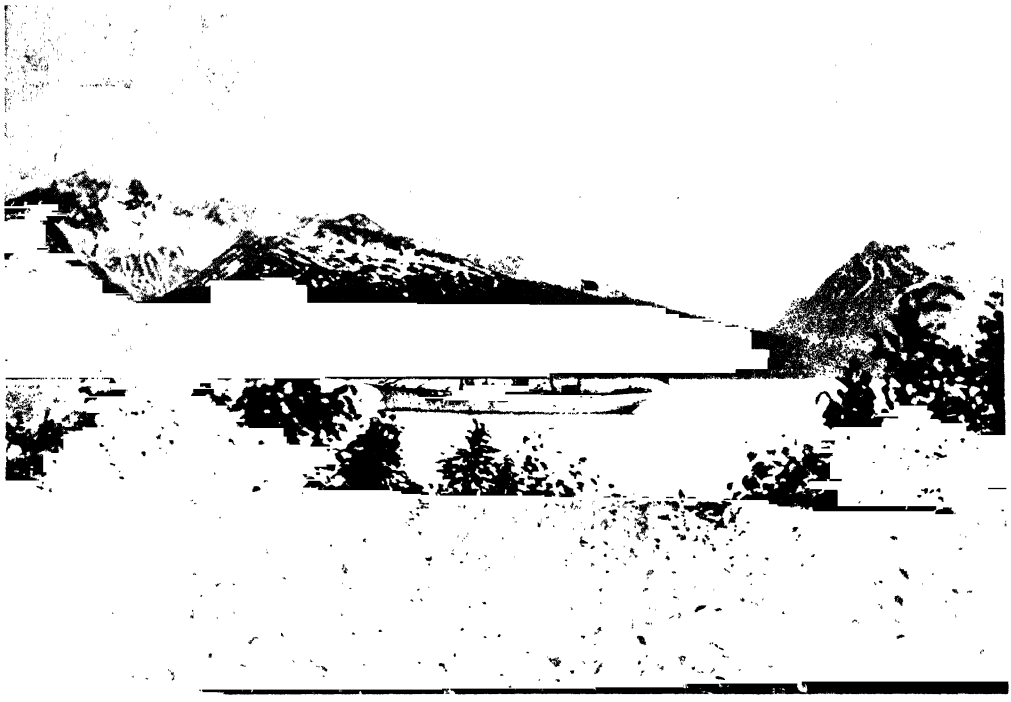
On June 1, 1915, this bayou covered 11 acres, and on November 15, 1915, it had wasted away to a pool 35 feet by 50 feet and 14 inches deep in the deepest part. Some of the fishes had been seined out earlier in the season, but on the final clean-up 150,000 were rescued and removed to open water. They comprised more than ten species of food and game fishes, including 30,000 catfish, 15,000 crappie, 25,000 sunfish, and 15,000 buffalo-fish.



PLANTING FISH IN THE OPEN WATERS: A RESCUE PARTY ON THE MISSISSIPPI

Fish not wanted for distribution to applicants are transferred in tubs and liberated in the open river

tom species, inhabiting moderately deep water, was, unlike most bottom fishes, a lover of warm water and found congenial haunts on a narrow strip where the Gulf Stream touched the edge of the continental shelf. There is evidence to show that about the time in question the Gulf Stream was receding, or moving offshore, and that its warmth eventually ceased to bathe the bottom frequented by the tilefish, which therefore came under the influence of a cold inshore current that took the place of the Gulf Stream. Being unable to adapt itself to the new conditions or unable to find new grounds where the depth and temperature were congenial, the tilefish in reality succumbed to a cold wave.



U. S. FISHERY STEAMER "ALBATROSS" AT ANCHORAGE IN RESURRECTION BAY, ALASKA, WHILE ENGAGED IN INSPECTION WORK

The United States annually takes from the waters of Alaska fish valued at more than three times the price we paid for that wonderful territory (see text, page 557)

Some years later, when the Gulf Stream was still "off soundings," investigation showed that it was approaching the coast, and the prediction was made that about 1892 it would again be flowing over the grounds on which the tilefish had once abounded.

The prediction was verified, and it is noteworthy that in the year named, after ten years of persistent search, during which not a single specimen was found, the Bureau's schooner *Grampus* caught a few tilefish in the old haunts. Evidently a remnant had survived, probably far to the south, and the fish had gradually worked back to the region formerly frequented. From that time on the species quickly reëstablished itself and soon became apparently as numerous as ever, so that today it occurs in great abundance along the 100-fathom line from a point south of the Nantucket Shoals lightship to a point southeast of Atlantic City and possibly much farther south.

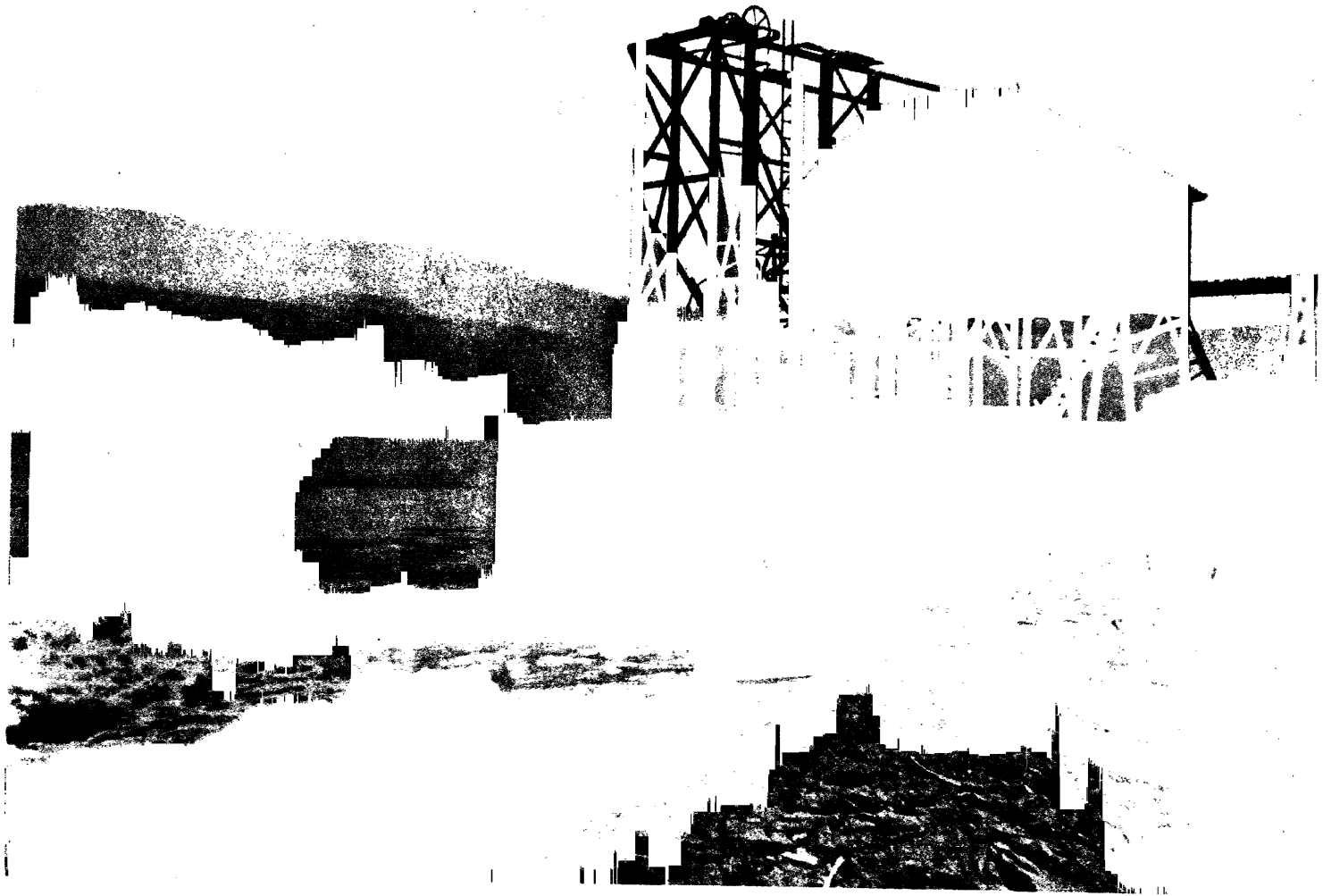
Believing that the food qualities, accessibility, and abundance of the tilefish warranted an attempt to establish for it a commercial fishery, the Bureau of Fisheries, in October, 1915, undertook the triple task of inducing the fishermen to catch the fish, the dealers to handle it, and the public to buy and eat it.

So successful were these efforts that, within one month of the date when the demonstration was begun, the Bureau was able to withdraw from the field and turn the project over to the commercial interests. A regular fishery has been inaugurated by Massachusetts, New York, and New Jersey vessels, of which more than twenty have been engaged at one time; and up to June 1, 1916, or in less than seven months, over 1,700 tons of tilefish, yielding the fishermen more than $200,000, had been caught and sold, chiefly in New York City, whence the product has been distributed over a large area, extending as far west as Chicago



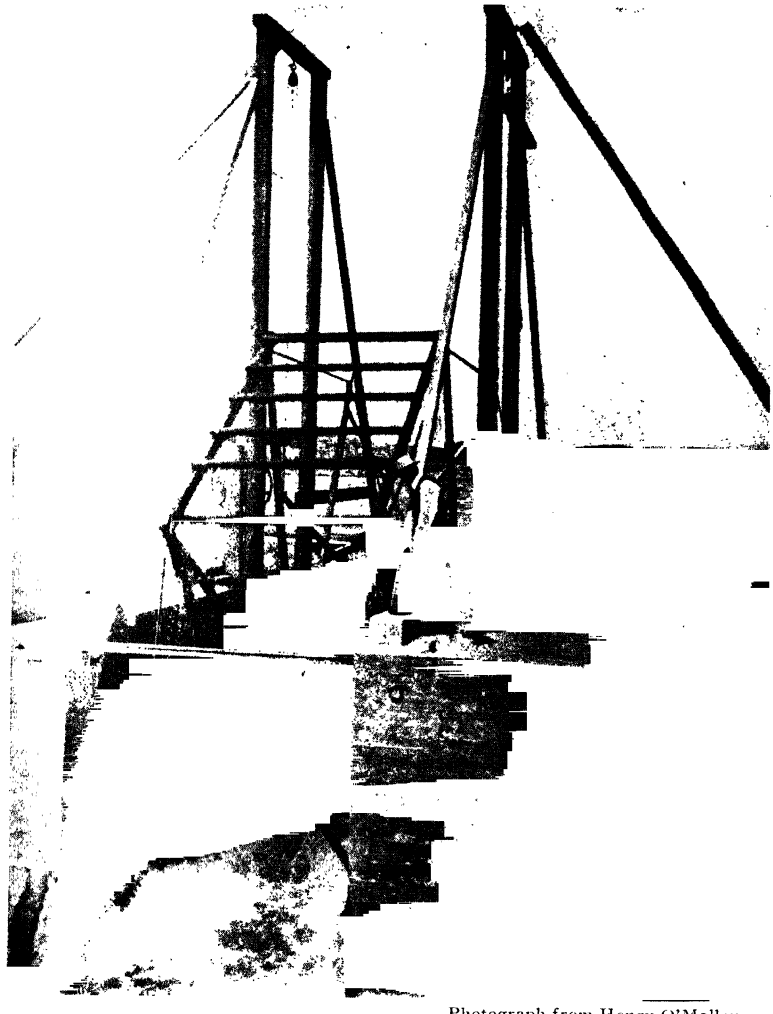
A 100-POUND HALIBUT CAUGHT BY THE U. S. S. "ALBATROSS" WHILE SURVEYING NEW AND LITTLE-KNOWN FISHING GROUNDS ON THE COAST OF OREGON

Large additions to the local food supply and good opportunities for the establishment of new fisheries have come from this work of the *Albatross*



A COLUMBIA RIVER SALMON WHEEL

Photograph from Henry O'Malley



Photograph from Henry O'Malley

NEAR VIEW OF A FISH WHEEL: COLUMBIA RIVER, OREGON

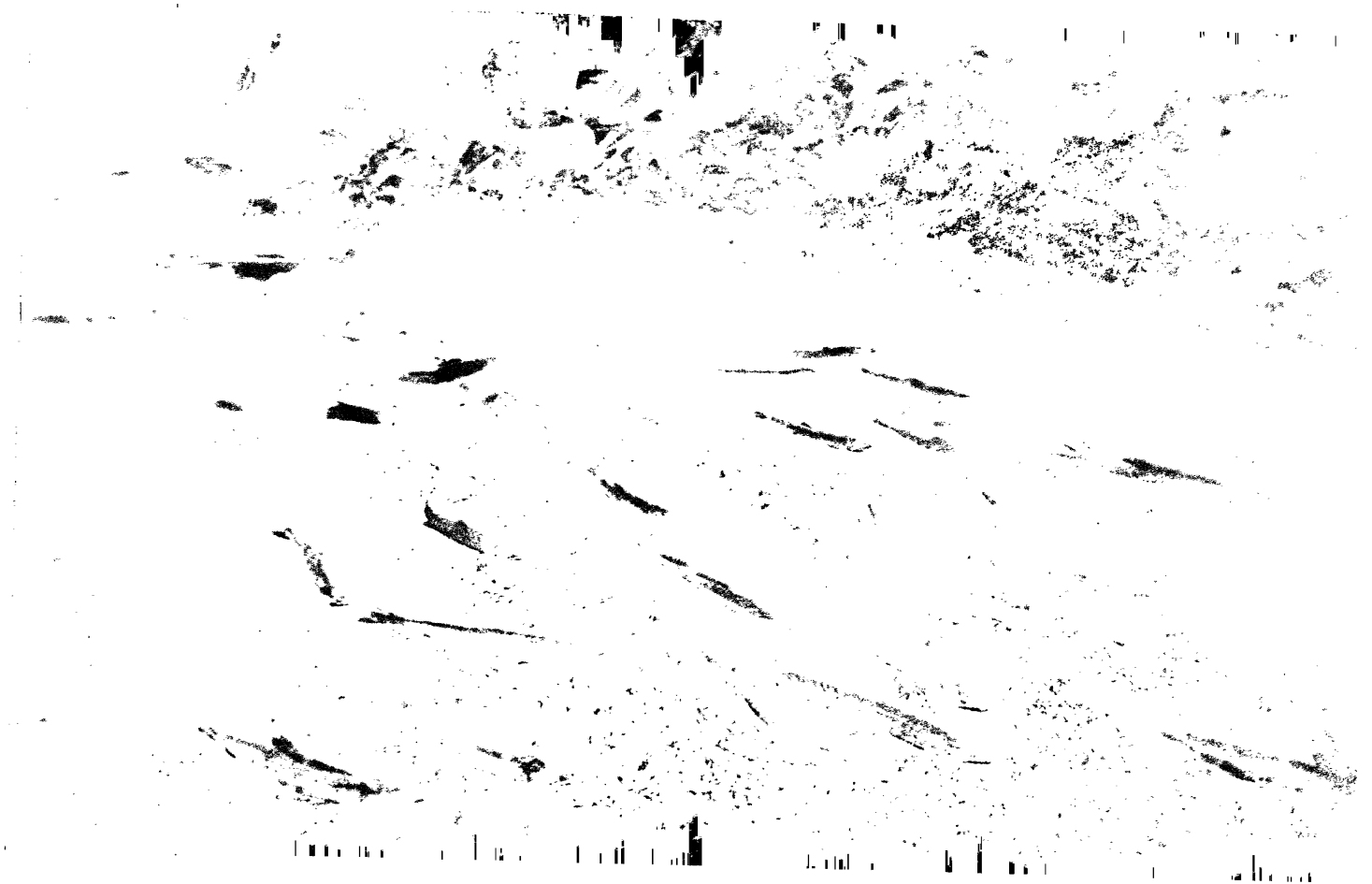
The salmon wheel reaches its highest perfection in the Columbia River, but is used also in parts of Alaska. It consists of a series of net compartments arranged in the form of a huge wheel, supported on a scow or on a crib-work, cement, or masonry base. The wheel can be used only in rapid water, as it is turned by the current and catches the fish swimming upstream. The above wheel, with a solid cement base, is operated at The Dalles.

and St. Louis and as far south as Atlanta.

AMERICA'S FUTURE SUPPLIES OF AQUATIC ANIMALS

Thoughtful people everywhere are asking the question whether our wonderful aquatic resources will continue without essential impairment and be an important source of food and wealth for generations yet to come, or whether the unmistakable decline which has befallen some of our most valuable products is but a forerunner of a condition to which all of our water animals are inevitably and speedily tending. We may profitably indulge in a little speculation regarding this question, with the history of the older nations to guide us.

There is every reason to feel assured that our great high-sea fishing grounds will remain productive and continue to



Photograph from John N. Cobb

A REMARKABLE PICTURE OF SALMON SPAWNING ON A GRAVELLY RIFFLE IN A PACIFIC COAST STREAM

There are five species of Pacific salmons, and all of them have the remarkable habit of dying after once spawning. This applies to both sexes, and was a wise provision of nature to prevent overstocking. The only other American food fish with this habit is the common eel, which spawns and dies at sea.



Photograph by Shirley C. Hulse

GATHERING EGGS FOR GOVERNMENT HATCHING

The male fish ("bucks") are put alive in the floating box shown in the left of the picture. The females ("does") are stunned by a blow on the head, after which their tails are chopped off. This bleeds the fish, and, later, when they are ripped open and the eggs removed, no blood appears. Should any blood get in the eggs, they would not hatch.

support valuable fisheries, subject to seasonal or periodic fluctuations, such as have always characterized free-swimming oceanic fishes as far back as authentic records go. Periods of great scarcity, such as have come to the bluefish and the mackerel on the Atlantic coast of the United States and to the sea herring on the Atlantic coast of Europe, are to be expected, just as are periods of abnormal abundance, such as characterized the menhaden in 1913 and the swordfish in the western Atlantic for the past few years.

It may confidently be expected that our coastal waters will continue to contribute their large quota of fish, crustacean, and molluscan foods, provided the attitude of the various States toward their fisheries is helpful. Inasmuch as many of the most valuable animals inhabiting the coastwise waters may be very injudiciously affected by improper methods and inadequate regulation, it follows that the proper handling on the part of the States will maintain the supplies or restore depleted resources. Furthermore, a very marked increase in the abundance of fishes and shellfishes may result from the institution of wise cultural operations under State encouragement.

In the Great Lakes and the major streams the future output of fish will be governed very largely by adequate, uniform, or harmonious interstate or international regulations. The serious decline that has characterized some of the principal fisheries in these waters is directly attributable to the failure of the States to appreciate the non-local character of the fishery question; the restoration of the depleted resources and the maintenance of the supply hereafter will depend on the realization by the States that they cannot ignore the nation-wide aspects of the situation, and that they cannot legislate for themselves alone. Fish culture, however effective or potent, cannot, unaided, remedy a condition that it was unable to prevent.

It is becoming more and more evident that, with the increase in population re-



Photograph by Shirley C. Hulse

BUCK SALMON CAUGHT AND HELD READY: OREGON

sulting in increased demands and with the injury to the fish life in streams resulting from obstructions and pollutions, the future fish supplies from our minor fresh waters must depend largely on cultivation, and that an important part of the fish consumed in suburban and country communities remote from the coast or large water-courses will result from private aquiculture.

Already a very marked change has occurred in the natural productive capacity of many of the minor fresh-water streams and lakes, and further far-reaching



Photograph by Shirley C. Hulse

FERTILIZING THE SALMON EGGS: OREGON

It sometimes requires two men to handle a large buck. As soon as the "milt" is in the pan with the eggs, a little water is added and the whole stirred until the mass of eggs is thoroughly impregnated.

changes are imminent. Various streams, particularly on the Atlantic slope, have ceased to be reservoirs of fish life and have become mere vehicles for the discharge of factory and city refuse; other streams, owing to the creation of dams, long ago ceased to be available for schools of migratory fishes that formerly resorted to them every season.

These were premonitory and for the most part neglected signs of conditions that are gradually arising all over the country. It may be doubted whether our industrial development is incompatible with the preservation of the physical and biological characters of our streams; but the history of other countries and the precedents afforded in our own country clearly indicate that, when the time comes to decide, the fisheries have to yield to



SALMON EGGS ON TRAYS READY FOR SHIPMENT

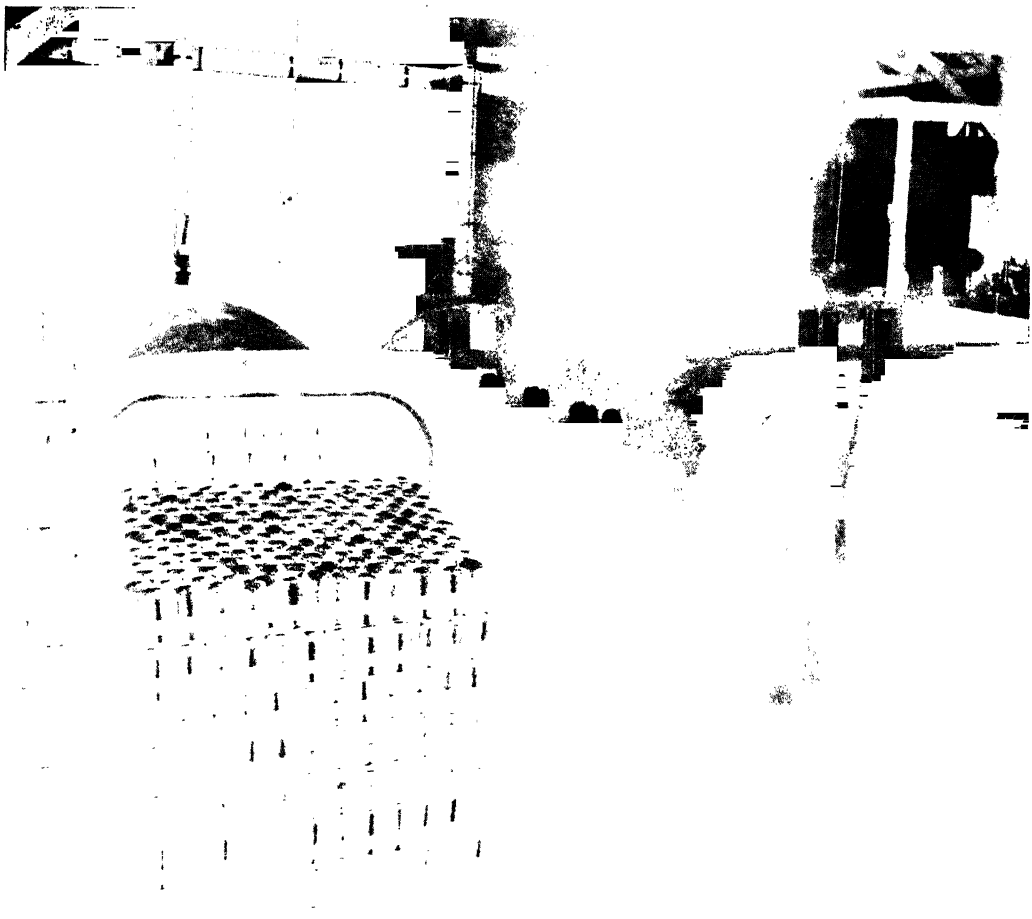
Eggs are packed in this manner for transfer between hatcheries and for distant shipment, as to foreign countries. The eggs packed in a case can, if kept cool and moist, remain out of water for several weeks without impairment. One hundred thousand eggs may be carried in a case.

what are adjudged more important interests.

The greatest problems that will hereafter affect the fish supply for a large part of the United States will be (1) how to replace or compensate for the large quantities of food that will have been cut off by the appropriation of waters for purposes incompatible with fish life; (2) how to make good the shortage in waters that continue to be overfished and have a declining yield, and (3) how to provide a fish food for the rapidly increasing population in regions having no major waters on which to draw.

The solution must be found in the general inauguration of private fish culture, which must necessarily reach its highest utility on farms and be conducted incidentally to the various branches of agriculture and animal industry.

A substantial start has already been made in this direction, and the Bureau of Fisheries has supplied hundreds of millions of artificially hatched food fishes for stocking hundreds of thousands of minor, private waters; but only a small proportion of the farms in the country are as yet equipped with fish ponds or fish lakes, and a great obligation now de-



Photograph by Curtis & Miller

A RETORT WHICH COOKS TWO THOUSAND CANS OF SALMON AT A TIME

Here they are given the final cooking under steam pressure. While large quantities of salmon are sold in a fresh, salted, or smoked condition, by far the major part of the catch is canned. In 1915 the pack of canned salmon in Alaska and the Pacific States exceeded 6,500,000 cases of 48 one-pound cans, valued at $30,000,000.

volving on the fishery service of the United States and of the various States is to make known the possibilities of private pond culture and to provide the necessary stocks of fishes suitable for different waters in different parts of the country.

The ample experience of private fish culturists in all parts of the country confirms the opinion often expressed by national and State fishery officials, that under given conditions aquiculture may be more profitable than agriculture; that an acre of the best water may yield larger returns than an acre of the best land, and that food supplies of untold volume and value may be expected from what are now unused waters.

COMMON AMERICAN WILD FLOWERS

In this number, pages 591 to 606, the GEOGRAPHIC MAGAZINE, *at very great expense, prints another series of colored pictures of Common American Wild Flowers. These exquisite paintings, as well as the subjects of the previous series, were drawn from life by Mary E. Eaton, of the New York Botanical Garden, the able director of which, Dr. N. L. Britton, has cordially coöperated in their preparation.*

In future numbers the GEOGRAPHIC *will present additional paintings of native wild flowers.*

No out-of-door interest brings to old and young richer returns in entertainment and instruction than is found in making the acquaintance of our wild flowers. Many of these, such as the daisy, mullen, aster, blue-flag, etc., are so plentiful that they may be picked at will; but there are others—for instance, the May-apple, spring beauty, lupines, lady's-slipper, etc.—which may become as rare as the trailing arbutus unless every one unites to preserve them. So it is to be hoped that the city dwellers who on their automobile excursions thoughtlessly cut and bring back great branches of dogwood and baskets laden with our rarer wood flowers will soon realize that, unless their plucking be tempered with judgment, the suburbs of all our cities will in the not-distant future be bereft of many of these flower treasures.

FORGET-ME-NOT (Myosotis scorpioides L.)

(See page 591)

The forget-me-not is a delightful immigrant belonging to that numerous family which includes the Virginia cowslip, hound's tongue, and comfrey.

The flowering season of this plant is from May to July. It came to us from Europe and Asia, and is now spreading from Nova Scotia southward along the Atlantic coast. It was led into captivity many centuries ago. As far back as we are able to trace flower history it held an honored place in the flower garden, and when America was settled, it was brought along to cheer the settler's austere life, and to remind him of the old roof-tree across the billowy sea.

The forget-me-not likes to play hookey from the flower garden, and to steal down to the brookside and meadow and live within earshot of the gurgling stream. With all that man has done for it, he has never bred out of it the spirit of independence that has been lost by most of the other flowers of the garden, for whenever opportunity affords, the forget-me-not yields to the call of the wild.

Have you ever noticed the little golden circle around the center of the flower? That little circle is put there by the flower as a honey guide, to tell the bee just where to insert her tongue to get the richest draught of nectar, and at the same time to touch both anther and stigma and thus fertilize the plant. And if you will watch the bees, you will discover that they are as careful to follow this signboard pointing to the well of nectar as a motoring tourist is to follow the signboard to the best hotel when night overtakes him.

There are many legends concerning the forget-me-not. Tennyson once wrote that it grows for happy lovers. Another writer tells us that once upon a time a young lover, trying to gather a bunch of these lovely blossoms for his sweetheart, slipped into the water and, as he was sinking, tossed the flowers to her and asked her to keep them and not to forget him.

VIRGINIA CREEPER (Parthenocissus quinquefolia (L.) Planchon)

(See page 592)

The Virginia creeper is a member of the grape family, cousin alike to the sour frost-grape of the woods and the luscious Concord of the vineyard. It has been called the false grape, although it is too fair a plant thus to be slandered by a name. No lover of the woodland will ever be made to believe that the Virginia creeper essays a rôle to which it is not entitled. Some people mistakenly call it the woodbine, but that name more properly belongs to another plant of the honeysuckle family.

Many people confuse the Virginia creeper with the rascally poison ivy, a confusion which nothing but carelessness in remembering the characteristics of plants could bring about; for the Virginia creeper is careful always to put forth five leaves where the poison ivy has only three (compare pages 592 and 593).

This graceful climber has traveled as far north as Newfoundland, as far south as Cuba, and as far west as the western part of the Mississippi Valley.

It lives true to its name, creeping on and on, securing a new foothold here and another there, sending out its tendrils as it grows. When one of these succeeds in arranging its branches so that they can press upon any surface, its curved tips swell and become bright red. On their undersides they form little disks or cushions, which attach themselves to the surface and afford a new foothold for the vine.

It is surprising how much weight one of these little disks can bear. Darwin tested their strength and found that one of them will stand a strain of two pounds, while five of them grouped together on a tendril can bear a weight of ten pounds.

What is more picturesque than the old-fashioned stone fence, or the stake-and-rider worm fence, with its load of green foliage in summer and its clusters of bright blue berries in the fall! Over fences, walls, and trees it rambles luxuriantly, and, while it seems to love its wild life best, it will gladly adopt one's very doorstep as its home, and welcome an opportunity to weave a curtain of living green over the sunny sides of the veranda.

In the autumn its blood-like sprays are outlined against the dark evergreens about which they twine, making a contrasting picture of rare beauty. The Virginia creeper has perhaps more honor abroad than at home, being widely cultivated in Europe. Even in Venice one may see it covering crumbling walls or gracefully clinging to carefully prepared trellises.

POISON OR THREE-LEAVED IVY (Toxicodendron radicans (L.) Kuntze)

(See page 593)

The poison ivy is a member of the sumac family, having as relatives the vinegar tree, the smooth sumac, and the smoke-bush. Its range reaches as far north as Nova Scotia, as far south as Florida and Texas, and as far west as Utah and British Columbia.

As described in the sketch of the Virginia creeper, it is often confused with that beautiful member of the clinging-vine clan. The Virginia creeper is condemned as being poison ivy oftener than poison ivy is accredited with being a Virginia creeper. Many a Virginia creeper has reached the untimely end of mattock execution by the error, and not a few people have received a painful reminder of their mistake when they have failed to observe that three leaves spell "foe" in the ivy vine and five leaves "friend."

The poison ivy, or poison oak, as some call it, is a prodigal climber, inclined to run over everything in sight. Even the oak sometimes is almost smothered when the poison ivy reaches its topmost branches and spreads its dense foliage over them.

It begins to blossom in May and June, its flowers being small, fragrant, yellowish green, and arranged in densely clustered spikes. Toward fall these develop into smooth, white, wax-like berries that often hold fast the winter through. The three leaves are shining green, short-stemmed, and oval-pointed.

The poison of this ivy is a powerful, non-volatile oil which penetrates the pores of the human skin and develops hosts of tiny itching blisters, followed by a burning swelling of the affected parts.

While we very naturally dislike a plant that poisons us when we touch it, yet if we investigate the reason for its poison we discover that a vast number of plants develop poisons and near-poisons, and when we look over the list we find that we would be rather badly off without them. It is true that most of them are poisonous only when eaten, and that few are poisonous to the touch, but they have all developed these qualities in self-defense.

Some of them store their poison in their seeds, others in their root-stocks, and others in their roots to protect their progeny from harm. They do not go about looking for trouble or seeking, like the devil, whom they may destroy; but they are prepared to resist invasion of the rights of their children. Nux vomica and aconite are two of many such illustrations that might be cited.

Others develop alkaloids, like the nicotine of tobacco, the quinine of the cinchona tree, and the theine of tea, to protect themselves. Strychnine, digitalis, and a hundred and one indispensable drugs that are poisonous in overdoses are the gift of the plant world to man as a by-product of plant preparations for self-defense (see also gentian, page 589).

And so, when the poison ivy learned to give off its poison by contact rather than through its own destruction, it simply went a step further than its neighbors. It has arranged its plans of defense, so that it can wage war without first being eaten. In that respect it meets the problem in the same way as the thistle and the thorn, although it fights by subtle stealth rather than open warfare.

STEEPLE BUSH OR HARDHACK (Spiraea tomentosa L.)

(See page 594)

Close of kin to the meadow-sweet, the goat's beard, the ipecac, and the common rose, the hardhack, or steeple bush, is one of the most cheery of the pink and magenta flowers of the roadside, ditch, and swamp, blooming from July to September.

Living in territory where competition for insect favor is always fierce and the battle of the blossoms a lively one, the hardhack arrays itself in a remarkable cluster of delicate florets at the top of a two or three foot stem, which waves welcome in the swaying breezes to the insect hordes.

And that it receives its share of the business of bee and butterfly is evident to any one who will stop to count the shoppers who visit this floral department store. The bees and the butterflies are welcomed, but the plebeian ants are frowned down upon and given a chilly reception. Most of the hardhack's trade is in pollen, as its supply of nectar is somewhat limited, and as difficult to secure as are fast colors among us in these war times.

Being a dweller in damp soil, the hardhack has had to take precautions to protect itself from colds. If the under side of its leaves were not covered with woolly hairs, the vapors rising from the ground would clog their pores and interfere with their breathing. Behind the shelter of this smooth coat of vegetable fur

the steeple bush can resist changes in the weather and degrees of moisture that otherwise would be injurious, if not fatal.

Many other flowers wear their coats on the top of the leaves rather than underneath. They are usually flowers that grow out in the open and get the full benefit of the noonday sun; they would die of thirst if they did not have some way to check the process of transpiration when subjected to undue heat; hence this coat of fur.

The distribution of the hardhack is rather wide, reaching from Nova Scotia to Georgia and Kansas. It has so arranged its domestic economy that in the event the insects fail to bring it pollen from other flowers it can use its own for purposes of reproduction—a plan which it resorts to, however, only in a last desperate effort to insure itself against an unproductive life.

BUTTER-AND-EGGS OR YELLOW TOAD FLAX (Linaria vulgaris Hill)

(See page 595)

Butter-and-eggs is another flower that prefers to dwell in the open among men rather than in the forests among the trees. It inhabits waste lands, roadsides, and fallow fields, and blooms from June to October. It continues to add its orange and yellow color to the landscape until the frost comes upon the pumpkins and the fodder has been gathered into the shock. It is an immigrant, having come originally from Asia by way of Europe; but it has already spread from Nova Scotia to Nebraska and Virginia.

The butter-and-eggs is preëminently a bumblebee's flower. If other insects visit it, they have a very difficult time to persuade it to give them a sip of its nectar. The doors to its honey wells are always closed, and are so hinged that nothing but a heavy bee can push them open. The honey-bee is too light to operate them, and consequently it usually departs hungry.

When the bumblebee arrives at one of the butter-colored cornucopias holding the yolk of an egg, it alights on the lower lip of the flower, and its weight causes the door to fly open and the sign of welcome to be displayed. The bee enters, sticks its pump-like tongue down into the cup of nectar, and takes a draught. While it is doing this it is receiving in its turn a liberal dusting of pollen and depositing some of that which it received from the flower previously visited. Then it backs out, flies away to another blossom, while the door closes after the departing guest.

The butter-and-eggs has a hearty dislike for ants, and it has therefore built itself breastworks which can withstand every attack they make. It covers itself with bristly hairs, all pointing in the direction of possible invasion, and the ant armies that can successfully overcome this preparedness program are few and far between.

The plant has many qualities that protect it, among others the acridity of its juices. Housewives, in the days when everything was homemade, mixed its juices with milk, and the result was an excellent fly-poison. They also made an infusion from its leaves, which they administered to ailing chickens in the spring.

Butter-and-eggs has many aliases. In some localities it is called yellow toad flax, while elsewhere eggs-and-bacon, flaxweed, and gallwort are names used to designate it. It is a member of that numerous and prolific family, the figworts. Among its cousins are the mullens, the blue-eyed Marys, the monkey flower, and the foxglove.

COMMON MULLEN OR VELVET PLANT (Verbascum thapsus L.)

(See page 596)

The mullen is a distinguished member of the figwort family—a family that includes the butter-and-eggs, the monkey flower, blue toadflax, hairy beard-tongue, the Indian paint brush, and the wood betony.

The mullen is a lover of dry fields, banks, and stony waste lands. An old abandoned grass field is its particular preference, and it grows there in numbers that are very discouraging to the lad with a hoe who has been assigned to the task of waging a single-handed war of extermination against it. It flowers from July to September all over the northeastern part of America and in Europe and Asia as well.

Like many of its fellow-members of the figwort family, the mullen looks like something else. In some places it is called the taper flower, because its tall stalk seems a "taper tall" carried by the witches in the olden days. In other places it is called Aaron's rod, shepherd's club, and Jacob's staff.

The mullen has been with us in America so long that Europe has almost forgotten the fact that it is a native of that continent. Indeed, in the popular mind there it is a native of America. The Irish cultivate it in their flower gardens and call it the American velvet plant; but, in reality, it is an immigrant which has made itself decidedly at home on our shores. It came over as a stowaway, riding in the ballast, like many another weed that has developed the instincts of the globe-trotting hobo.

Indeed, one might trace the history of commerce by the weeds that grow along its pathways. Many plants won a footing on strange shores by riding in earth ballast in the old days, and in more modern times cattle were driven hundreds of miles to market, leaving the routes they took marked with weeds and plants more or less alien to those districts. Today railroads are active disseminators of alien vegetation, many a weed having been able to start colonies far and wide through that agency.

The mullen owes its name of velvet plant to the soft, velvety appearance of its leaves. Being forced to endure intense heat in summer by reason of its preference for an open situa-

tion on a sunny hillside, it needs some check to keep it from transpiring too freely; and being under the necessity of enduring intense cold in the winter by reason of the open, unprotected situations in which it finds itself when in the year old rosette stage, it has had to find something in the clothing line capable of acting as a sunshade in summer and an overcoat in winter.

If you examine this sunshade or overcoat—depending whether you study the plant in summer or winter—you will find it made of many minute and interlacing hairs which are equally efficient in keeping out the cold and heat.

This velvety coat has its romantic as well as its commonplace uses. We are told that rural maidens rub their cheeks with it and thus produce that peach-blossom effect that the best rouge and enamel can never give them; and also it is said that humming-birds gather the downy velvet from the leaves to make their nests.

The mullen has had many uses. The Romans dipped the stalk into tallow and used it as a funeral torch. In the Middle Ages it was used as a candle-wick by many people. It is reputed to have medicinal virtues for both man and beast, smoking dry mullen leaves and drinking mullen tea being resorted to by those having colds. It won, in England, by reason of its reputation as a healer of cattle diseases, the name of "bullock's lungwort."

SWAMP ROSE-MALLOW (Hibiscus moscheutos L.)

(See page 597)

The swamp rose-mallow is one of the largest and most gorgeous of all indigenous American flowering plants. Growing to a height of 3 to 8 feet and having a flower from 4 to 8 inches in diameter, it is a marked feature of any landscape it undertakes to adorn. Its flowering season is in August and September, and it occurs as far north as Massachusetts and as far south as the Gulf of Mexico.

It is one of that vast group of wild flowers that are truly wild, preferring to remain away from the haunts of man rather than to come out and force him to cultivate it by stealing a place among his crop plants. Rather, as if to be of service to humanity by adding its touch of beauty to spots that otherwise would be ugly, it seems to prefer brackish swamps, unkempt river banks, and unattractive stretches of lake shore.

But while it is one of the truly wild flowers, it submits without protest to domestication and very peacefully takes its place in the flower garden alongside the hollyhock, which, by the way, is its distant cousin.

It has many other cousins, some more remote and some closer than the hollyhock. The velvet-leaf mallow came from India as a cultivated flower, but so attractive was the call of the wild to it that now it belongs in the category of "escapes"; for whenever a domesticated species runs away and gets a footing of its own it is written down by the botanist as an "escape."

And it is surprising how many of the flowers we see in the field and forest have thus seemed to resent the idea that they cannot live except under cultivation. We have bred the ability to set seed almost entirely out of sugar-cane; we have practically bred the seeds out of the banana and the orange; we have so cultivated our corn and wheat and most of our garden crops that they are wholly unable to shift for themselves any longer.

But, on the other hand, there are hundreds of plants that, despite long generations of coddling, still retain enough of vitality and self-reliance not only to shift for themselves when they have to, but even to seek the chance of doing so.

The mallow is a cousin of the cotton plant, the cotton fiber being nothing less than the woolly hairs with which that plant surrounds its seeds.

Many people confound the rose-mallow with the marsh-mallow. It is indeed a marsh mallow, growing in marshy ground; but it is not *the* marsh-mallow. That mallow has a small pink flower and is an alien brought to our shores; yet it is a true American in its spirit of being useful. It is from this mallow's roots that the tasty mucilage comes which we call "marshmallow" in the commercial world.

Still another cousin of the swamp rose-mallow is the gumbo, or okra plant, so popular in the Southern vegetable garden and figuring so much in the culinary operations of the kitchen.

The mallows can point with pride to a long lineage of useful service to mankind. Even as far back as the days of Job, many wandering tribes cut up mallows and juniper roots for meat, and the Romans had a mallow which they served as a vegetable. The ancients considered the mallow a powerful medicinal herb; Pliny records this high regard by declaring that whoever eats a spoonful of mallows "shall that day be free from all the diseases that come unto him."

SPOTTED BONESET OR SPOTTED JOE-PYE WEED (Eupatorium maculatum L.)

(See page 598)

Spotted joe-pye weed is a member of the thistle family and has many aliases. In some places it masquerades as trumpetweed; elsewhere it travels under the name of thoroughwort, while in still other localities it passes as cottonweed.

First of all, spotted joe-pye asks for a moist soil. Given that, it will live either in meadow or in wood. It is a rather late-comer in the flower procession, August to September being its months. As a habitat it claims all of that portion of North America between New Brunswick and Manitoba on the north to the Gulf of Mexico and the Rio Grande on the south.

Spotted joe-pye marches through the world with head held high, having long since learned that in the flowery kingdom, as well as in the business world, it pays to advertise. Therefore

it erects a sort of Metropolitan Tower in flower land, decked with a beautiful and wonderful collection of magenta flags. Of course, no insect could miss it, and during its business season it has a host of visitors, to each of whom it offers a cup of nectar in return for a little service as a pollen-carrier.

A clever arrangement has been worked out by the spotted joe-pye weed, whereby, if there happens to be a rainy spell and the insects are not flying when it blooms, it can fertilize its own florets, and thus protect itself against the evils of race suicide in flower land.

The spotted joe-pye weed derives its name from Joe Pye, an Indian herb doctor of Pilgrim days in Massachusetts. It is claimed that he cured typhus fever with decoctions he made from this weed. It is also claimed that with it he set shaking bones to rest in ague-rent bodies; hence its name "spotted boneset."

CHICORY OR BLUE SAILORS (Cichorium intybus L.)

(See page 599)

Chicory, otherwise known as "blue sailor" or "bunk," is an alien which came to our shores "riding the bumpers," so to speak. In the olden times, when ships carried earthen ballast, many a European weed got free transportation to America. It now flowers in Canada and the eastern United States as far south as the Carolinas; and in recent years it has pushed its star of empire westward, until it includes Nebraska in its American dominions.

It is a plant that loves to dwell around the haunts of men, and never wanders very far away from them; hence the roadside and the fallow field are its favorite dwelling places. It begins to flower in July, and is one of the last to pass of that myriad throng which comes while springtime snow-banks still linger, and goes only when the biting frosts of autumn come to stay.

Chicory has long been one of the wild flowers of immediate and important use to man. The Belgians, for instance, even in the years before the great war, their incomes being too slender to justify the drinking of coffee, resorted to the chicory as a substitute; and in the days before our own pure-food laws were enacted it became such a generally used adulterant that even the adulterant came to be adulterated.

Many a pound of what purported to be roasted chicory was perhaps half chicory and half roasted wheat or barley. In a single year we have imported nearly 7,000,000 pounds of chicory root. Even under the conditions prevailing just before the outbreak of the present war we were importing about 2,250,000 pounds annually. Some people claim that chicory added to coffee imparts a flavor which makes it better than coffee in its pure state.

In Europe chicory itself is very widely used as a pot herb. The French force it and blanch it, much after our way of forcing and blanching celery, and make of it a salad which they call *barbe de capucin*.

Homer used chicory root as a part of his frugal fare, and Pliny tells us that it was one of the staple dishes of the Egyptians.

There are many denizens of the plant world close of kin to the chicory. One of these is the dandelion and another is the endive.

Somebody has said that the chicory is a peasant posy, which, opening its eyes on a cloudy day, sets its pale-blue flowers abloom, one after the other, as sparingly as the lights are kindled in the candelabra of decaying palaces. To insure its reproduction, it never allows all of its flowers to come into bloom at once. By having them bloom in installments, it is sure at one time or another to have insect visitors that will fulfill its plans.

Chicory is very methodical in its ways, keeping regular hours and being one of the leading exponents of the idea that "early to bed and early to rise" works as well in the flower kingdom as among men. It generally awakens by 5 o'clock in the morning and shuts its eyes again at 10 a. m.; but during that time it has entertained some of the most delightful insect visitors that are to be found in any community. So regular is the chicory in its habits that the Swedish naturalist, Linnæus, used it as one of the flowers of his floral clock.

BUTTON BUSH (Cephalanthus occidentalis L.)

(See page 600)

The button bush is a member of the madder family, having among its relatives the dainty bluet, the fragrant partridge berry, the ride-stealing beggar's lice, and the aromatic-berry-producing coffee-tree.

One of the first traits we notice about the button bush is its constant endeavor to keep away from mankind. Knowing that the swamp is about the safest place from human incursions that it can find, it goes there and dwells in enviable isolation.

We are prone to be selfish enough to think that the flowers' beauty and fragrance were created for our especial pleasure and edification; and yet a study of nature's flower garden reveals the fact that some of the most fragrant of the blossoms of summer shed their sweetness and pour forth their beauty in precincts far removed from man's accustomed haunts.

One of these is the button bush. With an odor as seductive as that of jasmine, it could win its way into the hearts and homes of humanity if it desired to do so; but it has no inclinations in that direction, although, like the swamp-rose mallow, when led captive it submits gracefully and grows even more attractive than before.

Its closely packed host of florets, hundreds in number, with their long styles and capitate stigmas, making it resemble a well-filled pincushion, do not remain fresh long after plucking.

The flowering season of the button bush begins in June and ends with September, and its range is from New Brunswick to Cuba and

California. It is a shrub, and grows to a height varying from 3 to 12 feet.

The button bush relies more on its appeal to the nose than to the eye of the insect world, having discovered that most insects can smell further than they can see. Only a comparatively few flowers have learned this to as full an extent as the button bush. It is said by naturalists that in New York State, which has rather a wide range of plant species, borrowing both from the northern and southern flora, there are only about thirty really fragrant species to be found.

The result of the button bush's fragrance is that, in spite of any lack of gorgeousness its flowers may show, it always has a liberal share of the nectar drinkers of the insect world. Every "pin in the cushion" has its own individual honey well, and these are so deep that a short-tongued bee or butterfly never succeeds in drinking one dry. Butterflies come first among its visitors, and after them honey-bees and bumble-bees, though wasps and carpenter bees also seek a chance cup of nectar now and then.

The button ball has learned in the hard school of experience that there is degeneracy in self-fertilization, and has therefore so shaped its household economy that self-fertilization cannot take place. The power to produce pollen is lost by its anthers before the power to receive it is developed by its stigmas. Thus the pollen produced by a given set of anthers is not available for their companion stigmas, but must be transferred to those of some other flower.

In many flowers self-fertilization is prevented by the maturing of anthers and stigma at different times, just as is the case in the button bush; others have the stamens curved outward and away from the stigma. Still others have found still other ways equally ingenious and equally effective for the same end (see also fringed gentian, below).

And so it is that we see flowers ascending the scale of existence, ever laboring to improve their race, ever striving for a higher and better existence, ever seeking so to live and so to act that they will be able to bequeath to their posterity strength and fitness to survive.

Through the centuries fate goes on and on weeding out the unfit in flower land and teaching its inhabitants that the path to excellence is the only sure road to survival.

FRINGED GENTIAN (Gentiana crinita Froelich)

(See page 601)

The fringed gentian lives in low, moist meadows and woods, and begins to blossom when most of its fellows of the flowery kingdom have gone to seed and to death. One meets the fringed gentian from Quebec to Georgia, and as far West as the region beyond the Mississippi River.

When this handsome but late comer arrives even the birds have nearly all flown and their songs are only a memory, while the color of autumn is largely that of leaves which have arrayed themselves in the bright-hued garments in which they bid their parent trees farewell. It seems, indeed, that the poet was right who wrote that the fringed gentian comes with its merry blue to cheer the melancholy days that portend the passing year.

In order to insure the production of a full supply of fertile seeds, it has adopted methods insuring it against self-fertilization. The stamens mature and lose their power to fertilize before the pistils are developed, and it thus saves itself from that harmful inbreeding to which only flowers low down in the scale of floral existence resort (see also button bush, page 588).

The fringe of the gentian adds grace to it, but that was not the flower's thought in providing the fringe, for even the most lovely of flowers is utilitarian in its instincts. The ants long generations since developed a fondness for the nectar of the gentian; great hordes of them overran it and drained its nectar cups. But, since the flower had taken precautions to insure cross-fertilization, it could not afford to have the ants pilfer the nectar which was the currency with which it rewarded the bees and butterflies for their assistance in its new plan of fertilization. Therefore, like the butter-and-eggs (see page 586), espousing the cause of preparedness, it developed a system of defenses against ant invasions that is remarkable alike for its thoroughness and its beauty.

There are many kinds of preparedness in the plant world other than that used by the fringed gentian and the butter-and-eggs. Some plants secrete a milky juice which exudes whenever the plant is injured and which usually covers the invader with a touch of raw india-rubber. Others secrete resins, such as turpentine. Others supply themselves with a defense of tannic acid, while still others manufacture poisons, or have strong scents, like lavender and mint, or spines like thistles, or thorns like roses (see also poison ivy, page 585).

Some even go so far as to make friends with certain kinds of fierce ants, which keep the leaf-cutters away, as in the case of the South American acacia. The latter employs a species of police, or a standing army, of ants to keep off injurious insects or larger animals. The plant has hollow thorns, and upon the tips of its leaflets there are small projections full of sugary material. The hollow spines are inhabited by colonies of fierce soldier ants, which swarm out and drive off any insect enemy. They are fed, or "boarded," on these sweetish projections.

BUTTERFLY-WEED (Asclepias tuberosa L.)

(See page 602)

This hardy American, like many another wild flower, has no taste for the solitude of woods and marshes. Rather, it prefers to add its touch of color to the roadside, the dry or sandy field, and the hills. It loves to watch the world

go by and to cheer the passing throng with its brilliant orange-red flowers, its green leaves, and red stalk.

Nor is the butterfly-weed stingy with its favors, for June finds it decking itself with its splendid array of flowers; and only in September does it doff its georgeous colors.

The butterfly-weed sweeps in stately grandeur from Maine and Ontario to Arizona and the Gulf of Mexico.

Weed it may be to us, but sweetest inhabitant of nature's flower garden it is to the myriads of butterflies, for whom it is indeed a "land flowing with milk and honey." The high and the low, the rich and the poor, the great and the small—prince, noble, and pauper alike—come to its table. Here is the exquisite half-moon-winged swallow-tail, touching elbows, as it were, with the scrubby little cabbage butterfly, and the elegantly attired spice-bush swallow-tail sipping from a cup next to the one which the little old mud-puddle "yaller" butterfly is draining.

This flower, like its kinsfolk of the milkweed family, has a marvelous mechanism for forcing its guests to pay well for their board.

The alighting place where these animated aëros effect their landings is decidedly smooth and slippery, and the arriving guest finds himself on a surface which makes a newly waxed ball-room floor seem like a stony pathway in comparison. As he does a combination of the tango, the fox trot, and the jig trying to find a stable footing, one foot, or mayhap two, slips into a little slot, which holds fast. While wriggling around to get loose, his foot slips down farther into the slot. A sharp jerk releases the foot, if the insect is strong enough, but not until a little pair of pollen saddle-bags has been bound to it. Bumblebees sometimes get away from a plant with half a dozen of these little saddle-bags hanging to their legs.

At the Centennial Exposition at Philadelphia, in 1876, a bed of beautiful flowers brought over from Holland won the admiration of many thousands of people; and yet they were only a Dutch edition of our own butterfly-weed.

The Indians used the butterfly-weed's root in treating pleurisy, and made a crude sugar from its flowers. They used the young seed pods in the cooking of buffalo meat much as we might use green peppers with chicken or hash.

JACK-IN-THE-PULPIT (Arisaema triphyllum (L.) Torr.)

(See page 603)

Jack-in-the-pulpit is one of the denizens of flowerland that seldom ventures out of the forest. It loves wet, marshy ground, blossoms from April to June, and claims as its own all of that vast territory from Nova Scotia westward to Minnesota and southward to the Gulf of Mexico.

Jack is a member of a numerous family, among its relations being the stately calla lily, loved by all who appreciate beauty and grace, and that black sheep of flowerland, the skunk cabbage.

What country boy has not been tempted into tasting of "Indian turnip root," to his sorrow and to the great burning of his mouth? And why should he not suffer, for that root which has been ruthlessly torn up represents the hard-earned savings of Jack-in-the-pulpit. During the happy days of the summer-time Jack labors hard to pay the premium on his life insurance, so that in the spring to follow, when he is dead and gone, his heirs may rise up possessed of a "grub-stake" that will provender them until they can win their own place in the world. Many plants thus insure their lives in behalf of their posterity, giving every bit of their surplus income over to a root-stock fund for their children.

Jack-in-the-pulpit got his name through the resemblance of the little hooded house of green which he builds to the old-time pulpits, which had a sort of hood over them.

He received his name of "Indian turnip root" through the fact that the Indians habitually raided his root-stock insurance, and, boiling the "bite" out of it, made of it what they considered a delectable dish.

Another cousin of Jack's, as stated before, is the skunk cabbage, which has the painful habit of smelling bad; and yet there is method in its madness, for it is an insectivorous flower. It tries to simulate the odor of decaying meat in order that all of the flies, the big blue-bottle ones and all their neighbors, may be attracted its way. As soon as it gets them, it lays hold of them, and makes a feast of them instead of for them. It is strange that a family with such a noble head as the calla lily could possess a sheep so black as the skunk cabbage, and it is equally strange that the floral procession of the year should be headed by this evil-smelling representative of the flowery kingdom.

Jack-in-the-pulpit is gradually copying the ways of the most disreputable member of his family, instead of trying to live up to the beautiful reputation of his fair cousin the calla. He has so arranged his pulpit that once a tiny fly or ant or bee gets in, it has mightly little chance to escape. A bear was never more firmly held by the jaws of a big steel trap than are the bees in the little green trap which Jack sets.

YARROW OR MILFOIL (Achillea millefolium L.)

(See page 604)

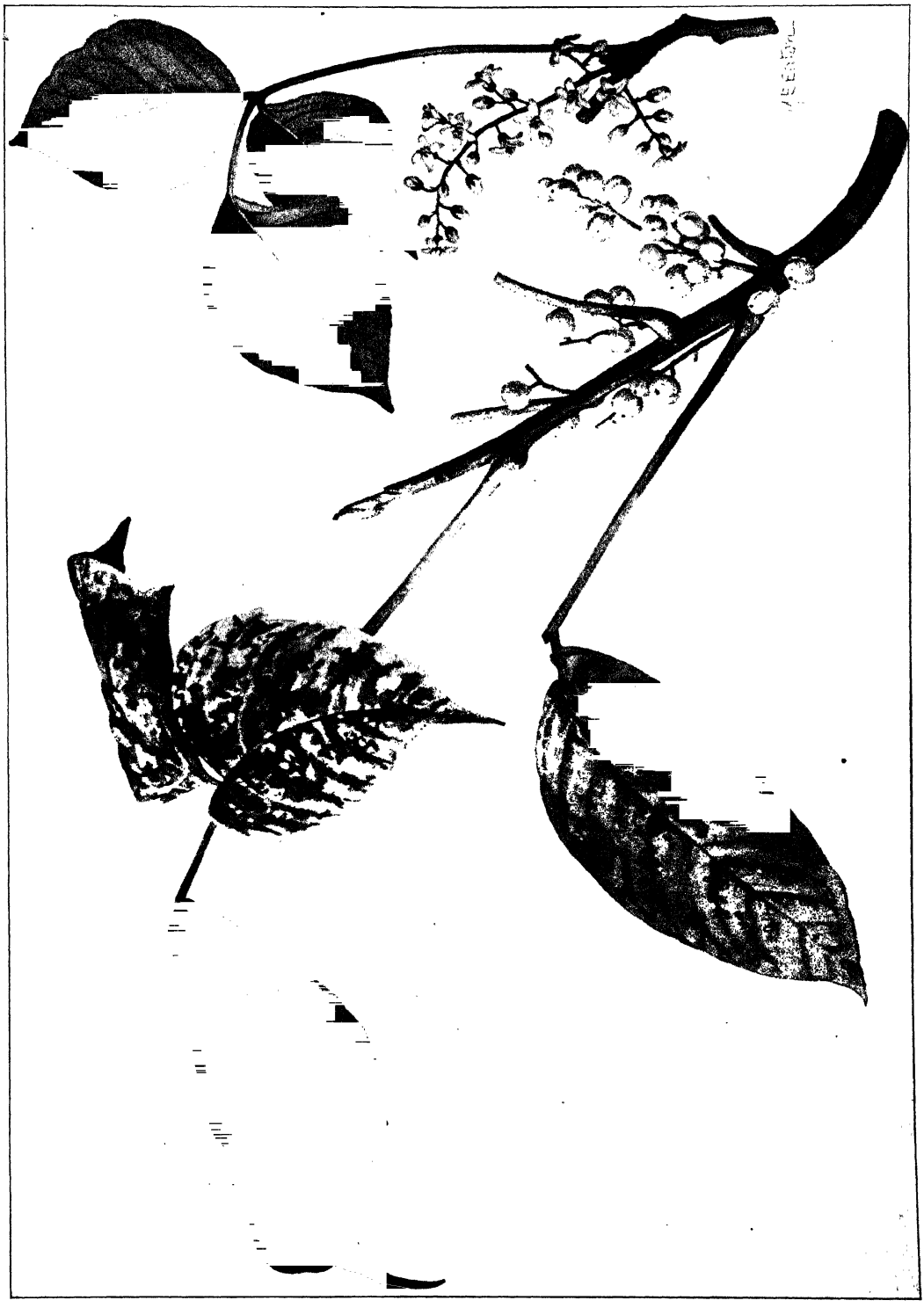
The yarrow is a member of the thistle family, though it defends itself from the attacks of grazing animals by its odor rather than by pricking spines. It is true that it has incipient spines in the shape of bristly hairs, but these are not stiff enough to do any damage.

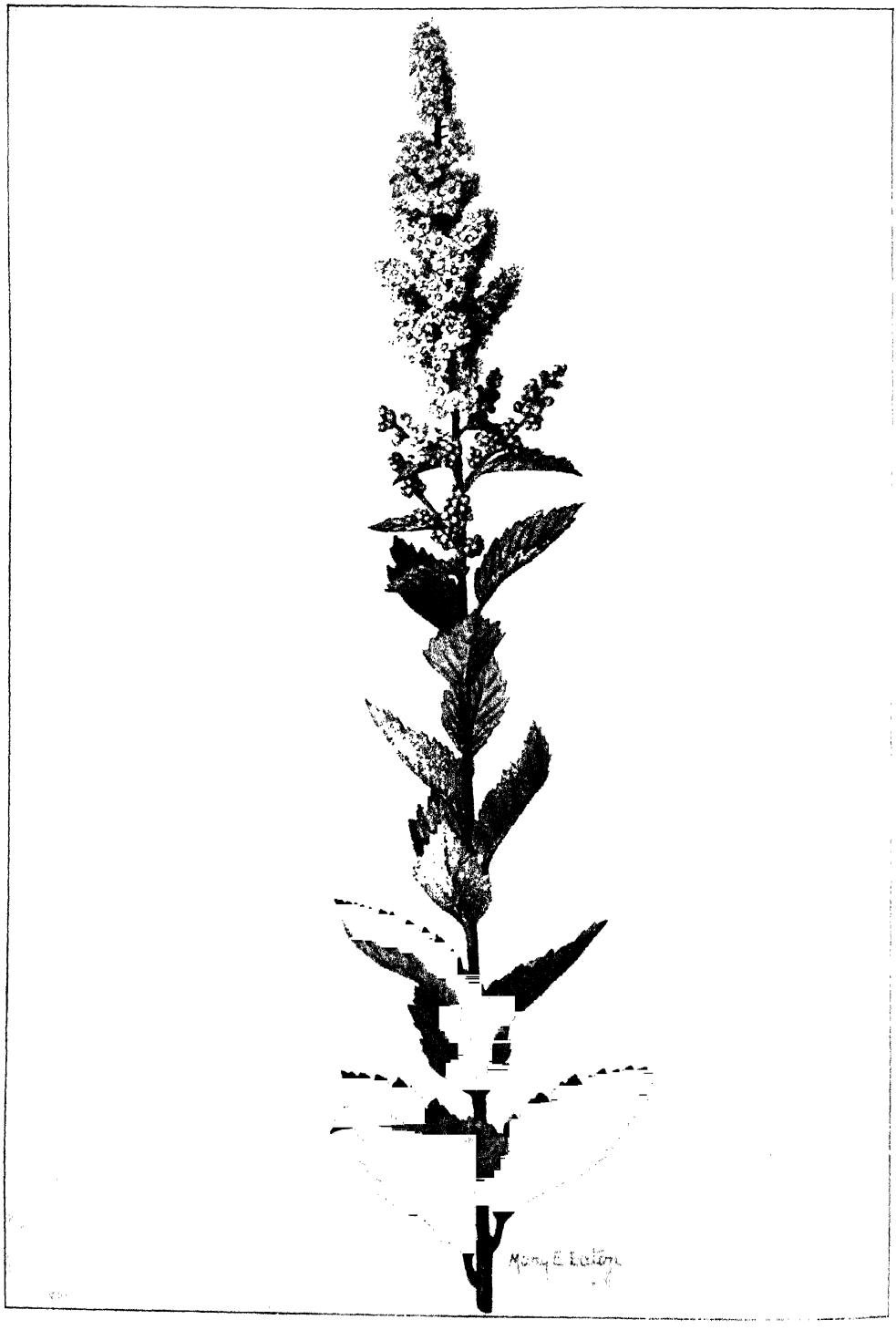
Yarrow has as many different names as a modern Raffles. Some call it milfoil, crediting it with having a thousand leaves, just as rural folk credit a centipede with being a thousand-leg worm. Others call it "old man's pepper," by reason of its spicy aroma, and others nosebleed, by reason of its nosebleed-producing qualities. Still others call it soldierwort, by



FORGET-ME-NOT
Myosotis scorpioides L.
591







STEEPLE BUSH OR HARDHACK
Spiraea tomentosa L.



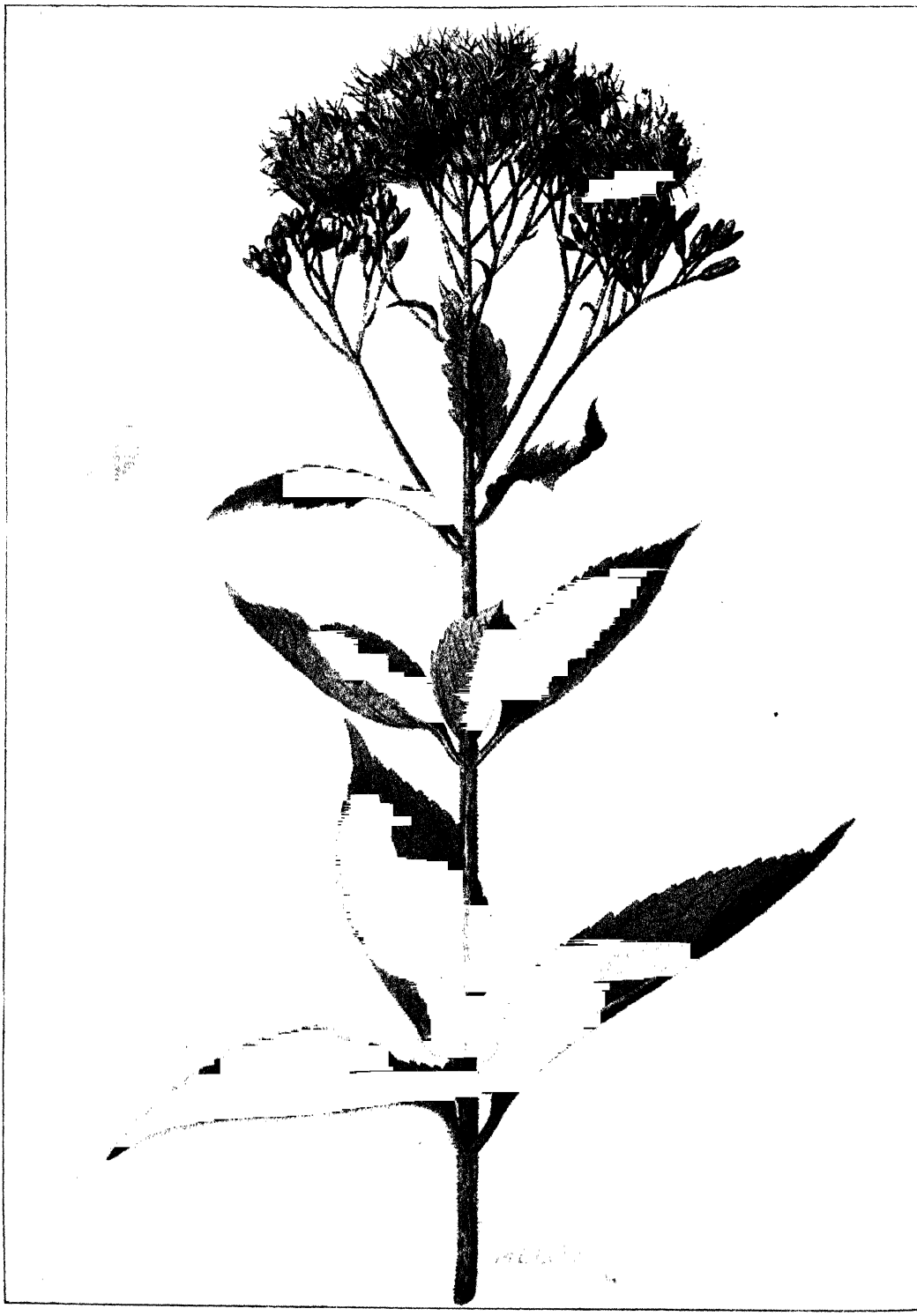
BUTTER-AND-EGGS OR YELLOW TOAD FLAX
Linaria vulgaris Hill
595



COMMON MULLEN OR VELVET PLANT
Verbascum thapsus L.
596



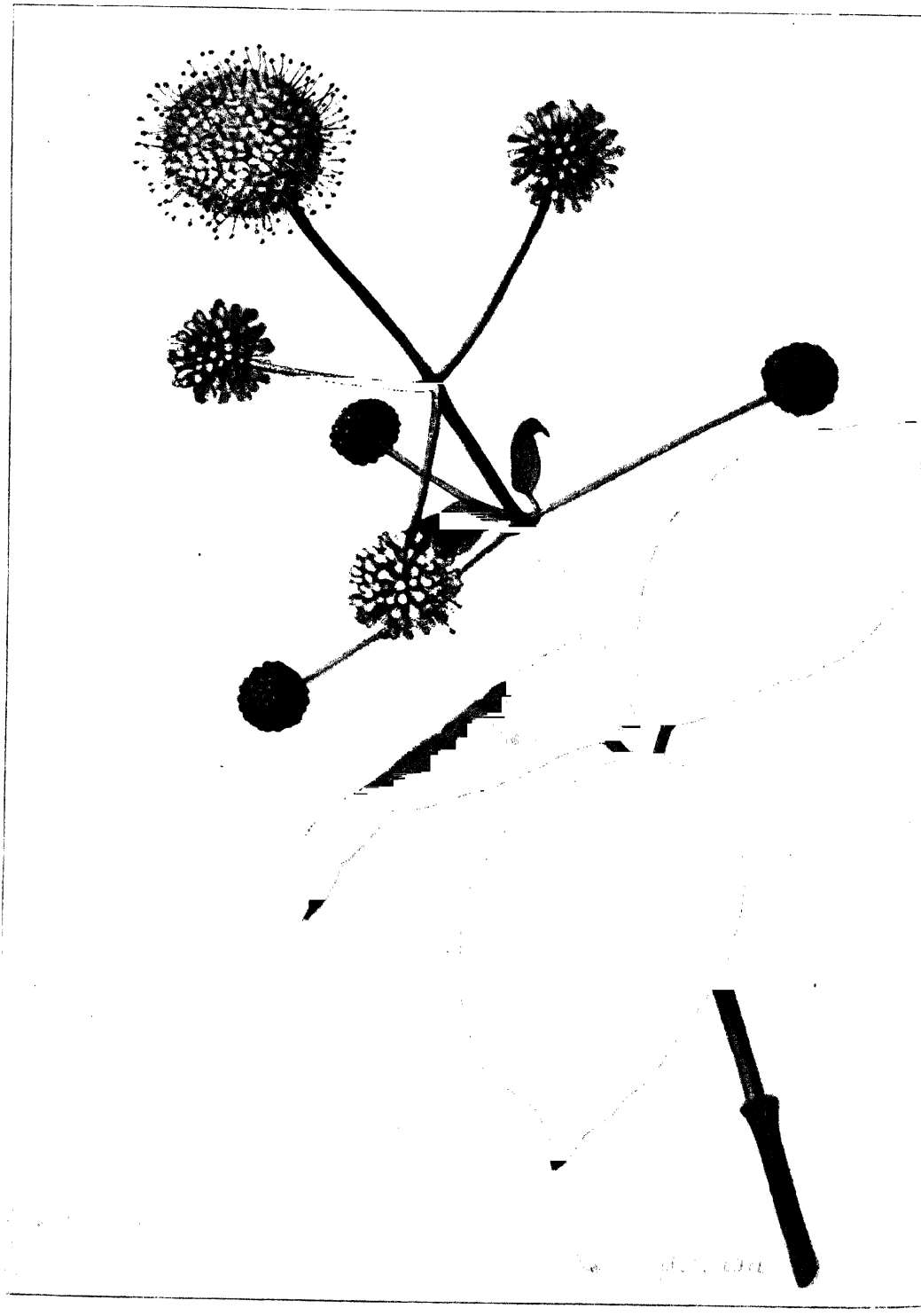
SWAMP ROSE-MALLOW
Hibiscus moscheutos L.
597



SPOTTED BONESET OR SPOTTED JOE-PYE WEED
Eupatorium maculatum L.



CHICORY OR BLUE SAILORS
Cichorium intybus L.



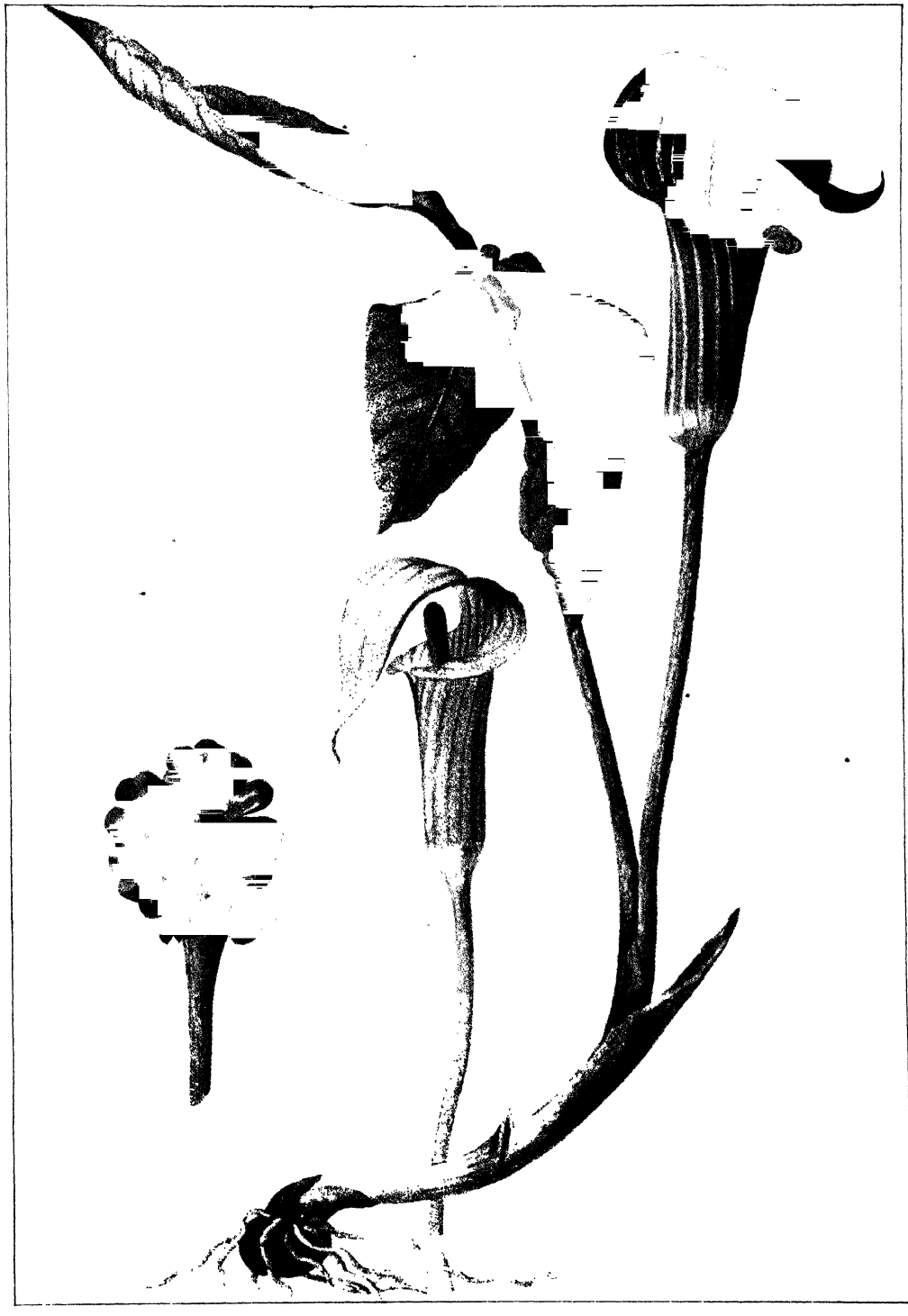
BUTTON BUSH
Cephalanthus occidentalis L.
600



FRINGED GENTIAN
Gentiana crinita Froelich
601



BUTTERFLY WEED
Asclepias tuberosa L.



JACK-IN-THE-PULPIT
Arisaema triphyllum (L.) Torr.



YARROW OR MILFOIL
Achillea millefolium L.

FIRE WEED OR GREAT WILLOW-HERB
Chamaenerion angustifolium (L.) Scopoli



NEW ENGLAND ASTER
Aster novae-angliae L.
605



reason of its efficacy as a homely remedy in the treatment of wounds.

It derives its official Latin name from the Greek warrior Achilles. We are told that Chiron, the centaur, taught its virtues to the defender of ancient Troy, who made from it an ointment with which to heal his wounded myrmidons.

The yarrow is widely used in the remote rural districts as a love charm. A girl wraps it in flannel and puts it under her pillow, repeating a verse. The next day she puts it into her shoe and asks it to guide her footsteps to her future husband. The first single man she meets is supposed to be the one it recommends to her.

When is a plant a flower and when a weed is a question that often has been asked. Some one has called a weed a vegetable vagabond which adds to the vice of idleness the good-for-nothing trait of mischievousness.

The yarrow is a charming flower to some. To the city-born it is an exquisite, lacy flower, so much so that it is sometimes cultivated. In the Azores it is cultivated as the lace plant, and one writer reports having seen it growing on the lawn of an exclusive home on Fifth avenue, New York. But to the farmer whose hay-fields it invades, and to his sturdy sons who must work many a hot summer day to keep it from running away with the farm, it loses all its poetry and romance and grace and becomes a living sign of a poor farmer—a weed of the worst type.

When one considers how the yarrow chooses the grass fields as its favorite habitat and makes the farmer help to propagate it by cutting it with his hay, and thus scattering its seeds far and wide, he cannot but reflect upon the wonderful determination with which it fights extermination.

Indeed, the more "pestiferous" a weed is to a farmer, the greater have been its achievements in the way of overcoming obstacles. One would admire greatly their gameness, their generalship, and their spirit of "facing their fortunes like a man" were not their triumphs the farmer's defeats.

Take purslane, lambs quarter, and a dozen other weeds. They need cultivation to thrive well, so they steal into garden and truck patch and compel the gardener to cultivate them while he cultivates his vegetables.

Then there is corn cockle, "croutweed," garlic, and innumerable other weeds which like nothing better than to get into a wheat-field and get cut along with the wheat. The farmer must thresh them with his wheat, and thus they get sown in well-prepared soil once again.

Nearly all the weeds have learned to fit themselves to those farm operations which are best suited for their spread. That is the reason that yarrow gets such a firm hold wherever it goes. The farmer cannot "make hay" without "making yarrow," too.

The insect world likes the yarrow if the farming population does not. More than 120 species of bees and butterflies visited a watched plant in a single day. Its nectar stands seem as popular in insectdom as the pink lemonade stand at a circus or a soda fountain at a corner drug store on a hot day.

GREAT WILLOW-HERB OR FIRE-WEED (Chamaenerion angustifolium (L.) Scopoli)

(See page 604)

Nature appears to detest ugliness as much as she abhors a vacuum, and seems to have created the fireweed as an antidote for one of the ugliest sights a landscape may offer—burnt-over ground; for it is first and foremost among the flowers to labor for the blotting out of these inkspots upon the carpet of the earth.

The fireweed deserves its name, for it seems to be a real Phœnix among the flowers, rising out of the ashes in green and pink robes as though the flames had been its friends.

It takes to the fallow field and the dry roadside when it cannot find a burnt district to cover, and begins to blossom with the coming of June, and only with the passing of September joins the somber host that marches to its doom when Jack Frost turns executioner with the cutting cold as his ax.

A genuine cosmopolite is this "first aid" to burnt-over Nature, for it is not only at home in America from the Atlantic to the Pacific and from Canada to the Carolinas, but also in Europe and in Asia. It belongs to that extensive family of which the evening primrose is the name-giving member, and of which the primrose willow, the long-stemmed sundrop, the fuschia, and the enchanter's nightshade are distinguished representatives.

The scheme by which the fireweed saves itself from the evil of self-fertilization is the same as is used by the button bush (see page 588), the holding back of the styles from maturity until such time as the pollen from the flower's own anthers is gone. As soon as that happens the down-curving styles bend upward, so that no bee or butterfly that has come to them from another flower can get a single sip of nectar without first giving them numerous grains of pollen dust in exchange.

What a lesson for men in the relations of the bees and butterflies with the flowers! There is keen competition and lively bidding for insect favor, but there are neither strikes nor price-cutting wars. A sip of nectar for a dash of pollen has been for countless generations the ruling quotation. Both flower and insect are satisfied with the bargain, and each passes through the years glad that it can be of service to the other and happy that the other can serve it so well.

The first instinct of every flower is so to live that when it dies it may live again, not in its own being, but in generations of sturdy progeny. Innumerable are the expedients which they employ to bring about that happy result.

Some of them, like the rose of Jericho, pack up bodily when the dry winds of the desert come along, and roll before them, root and branch, until they strike some moist place,

where they unpack and start life again. Others tie sailor knots or make elastic springs. When the seeds are ripe, these stretch like a rubber band, break, and catapult the seeds like a pea-shooter.

Still others put hooks in their seeds, so that they can send them far and near by stealing rides on animals, such as the cockle bur. And then there are others that were perpetuating themselves by their mastery of the principles of the parachute countless generations before man dreamed of a balloon.

Among these latter is the fireweed. It has a slender, curved, violet-tinted pod in which are nested numerous seeds, each attached to a tuft of fluffy, white, silky thread. When the seeds are ripe, the pod bursts open, and as the winds come along they start the little seed-laden parachutes a-sailing through the air to destinations whose distance is limited only by the velocity and the duration of the wind.

And so it sends its children far and wide, hoping that each one may land in some hospitable spot, ready with the advent of another summer to become, in its turn, the founder of other colonies.

NEW ENGLAND ASTER (Aster novae-angliae L.)

(See page 605)

Like its cousin the thistle, and like the daisy and the sunflower, the aster is one of the most civilized of flower peoples; so well have they adapted themselves to the necessity of varying environment that they have been able to travel around the earth and to make themselves at home wherever they go.

They ask odds of nobody. Through countless generations they studied the best methods of insuring their survival against the fiercest competition, and finally developed the idea of the composite flower. It was like a Forty-niner striking a bonanza mine! And so we find them wholly self-reliant, self-sufficient, and ready to fight all comers for their right to a place in the sum of existence.

When they started out they were like the grass—dependent upon the wind to carry their pollen; but as they journeyed down through the ages they gradually discovered that the wind was not always a trustworthy messenger. The more progressive among them decided to employ insects instead of breezes as their pollen-bearers.

Their first "help wanted" advertisements were a few dainty flower petals, but this innovation was so successful that they began to do a land-office business. They found that myriad armies of insects were ready to be mustered into their service.

So successful indeed was the experiment that they decided to extend their business still further, and to employ in their appeal for recruits display ads in the shape of great groups of flowers instead of want ads in the shape of isolated blossoms.

And their second adventure was as successful as the first. They offered high wages in easily reached and abundant nectar of the best quality, with the result that they were able to command the services of the most reliable of the messengers of all insectdom.

Their brands of nectar were so well advertised and maintained such a high standard of purity that their big page ads drew vast hordes of winged Mercuries, and, having become the biggest users of printers' ink in flower land, their respective establishments grew and grew until their names became household words in insectdom.

Today they are the captains of industry, the Napoleons of finance, and the people with a vision of flower land. The daisy army transforms millions of acres into white and gold in summer, while in autumn the aster and golden-rod proclaim their triumph through millions of acres of yellow and blue.

There are about 120 species of asters in the United States. The New England aster, the subject of this sketch, is one of these. It occurs most frequently in New England, as its name implies; but it has been extending its territorial possessions somewhat, and now occurs in the maritime provinces of Canada and as far south as the Gulf of Mexico. Its flowering season is from August to October, and its favorite habitat swamps, moist fields, and roadsides.

WILD YELLOW OR RED PLUM (Prunus americana Marshall)

(See page 606)

With a flower as fair as any that blooms, even though it is but a small blossom, and fruit that, with its rare transparent coloring, is the soul of beauty, the wild yellow or red plum has a host of friends who rate it high in the order of things delightful to the eye.

This plum is a genuine American, having dwelt here even before the legendary Norsemen came to these shores. And it is of such sturdy stock that it has been widely used to give new life and to infuse new hardiness into the effete plums that have come to us on the wings of commerce from Europe.

Since the scientists have become masters of the art of cross-breeding trees and plants, they have learned to couple the hardy, self-reliant, disease-resisting traits of the wild species with the improved fruit-producing traits of the tame varieties that have come to it through centuries of selection. In that way they have given us a long list of new and improved plants.

They go to the desert for clovers to cross with our ordinary stock and give us drought-resisting pastures; they go to Peru for "new blood" for our potatoes, and we get hardier varieties than we had before; they take the hardy Japanese bitter orange and cross it with the domesticated orange and get a wider area for its cultivation.

And so the wild plum has been made to do duty in the development of a dozen or more

varieties of cultivated plums. Its range is from the Atlantic coast west to the Rocky Mountains and south to the Gulf of Mexico. It blossoms in April and May and bears fruit from August to October, preferring to grow in narrow, open woods and along the borders of streams.

The plums are distinguished from the peaches through their smooth coats and their unwrinkled seeds. It is a curious fact that the varieties derived from the wild yellow or red plum and its related American species, and also the Japanese plum, are practically sterile to their own pollen, and do not produce profusely enough for profitable cultivation unless within reach of other varieties for cross-fertilization.

The plum has its own peculiar enemies, both fungus kind and insect kind. One sort of fungus which attacks it begins its work soon after the plum sheds its bloom, and as the fruit begins to grow it develops a "plum-pocket" an inch or two long, which presents a hollow, bladder-like appearance. The attacked fruit develops with thickened walls, but with no pit. The fungus also attacks the leaves and stems, causing them to assume a bloated, distorted appearance.

The insect which is the especial enemy of the plum is the curculio, a small, rough, grayish black beetle about one-fifth of an inch long and with two peculiar bumps on its back. The female selects a plum in which to deposit an egg. With her little snout she makes a short slit about one-sixteenth of an inch deep and places her egg therein. Then she cuts another slit, crescent-shaped, in front of the other one, in such a way as to cause that side of the plum to wither and to prevent the fruit from healing up around the egg.

When the larva hatches out, it feeds on the fruit around the stone until the plum, now thoroughly diseased, falls to the ground, carrying it along. It then climbs out of the fruit, digs down about a third of a foot into the ground, and there makes a little cell in which it transforms itself into a pupa in from three to six weeks. As an adult it emerges, selects a place for hibernation, and sleeps until next year's trees begin to bud, feeding on twigs and buds until the fruit begins to form.

THE CITIZEN ARMY OF HOLLAND

By Henrik Willem Van Loon

Author of "The Fall of the Dutch Republic," "The Rise of the Dutch Kingdom," Etc.

THE Holland with which we are all familiar is a picturesque combination of dikes and windmills, smiling girls with pretty lace caps, and very small boys with very big cigars. There is another side to this picture to which we have paid less attention; that is the Holland of the modern merchant and the modern scientist — a small bit of land teeming with industry and busy with a thousand different affairs—a country administering a vast colonial empire without the use of a large military establishment and capturing Nobel prizes at a most enviable rate.

This modern Kingdom, with its harbors and its vast foreign trade, forms a small but concise national unit in the midst of very powerful neighbors, who for over two years have been engaged in the most gigantic of all wars. Yet Holland has managed to keep out of the struggle with lasting success. It was able to do this because in a military sense it was fully prepared for all eventualities.

A COMPARISON OF BELGIUM AND HOLLAND

The Kingdom of Belgium was not prepared for war and it was invaded and overrun by a hostile army. The Netherlands, although smaller in number of inhabitants, had the entire arm-bearing force of its male population at the frontier 48 hours before any of the other nations of Europe mobilized. As a result, the neutrality of the country has been rigorously respected.

Strategic reasons, however, for an invasion of the country have been present ever since the month of October of the year 1914, when the Germans captured Antwerp. A cursory glance at the map will show that the Germans thereby acquired the most important naval base in their warfare upon England. Yet they could not use it as long as Holland closed the mouth of the Scheldt with mines and gunboats and land fortifications.

Upon several occasions there was an uneasy and panicky feeling that the Ger-



QUEEN LHELMINA INSPECTING WORK OF ER EXPERT DETACHMENT OF ENGINEERS

man armies might try to force the mouth of the Scheldt and make Antwerp a naval port for the benefit of their submarines and warships. During many anxious weeks the people of the Netherlands have had the unpleasant sensation that the General Staff of the German armies was figuring and computing the exact debit and credit side of a violation of Dutch territory. Often it seemed that the next morning might bring the news of a German invasion. But every time thus far the careful accountants of the efficient Imperial Staff must have come to the conclusion that an invasion of Dutch territory would cause more harm than good. The troops which had been massed on the southern frontier of Holland disappeared; the guns went rumbling back across the heavily paved roads of Flanders, and the port of Antwerp remains closed to this day.

The activity of the Dutch army, however, has not been directed exclusively against the eastern neighbors. Holland knows that it would provide an excellent thoroughfare to the Rhine region and the steel works of the Krupp family; therefore every quarter mile of the entire coast is guarded day and night. The sand-dunes, which provide a wonderful natural barrier, have been fortified with hidden guns and well-covered positions for machine guns. The towns and villages situated behind the dunes are well garrisoned, and an excellent system of roads running parallel with the coast enabled the Dutch Government to transport artillery and infantry to any threatened spot within less than an hour. Torpedo boats and a flotilla of submarines patrol the coast at all times. Thus far they have been able to save the lives of many shipwrecked sailors, but they have not been called upon to do active service.

FIREPROOF THOUGH SURROUNDED BY FIRE

All this is in keeping with the heavy sacrifices which the Dutch people have for years made for the defense of their country. They do not intend to use their army for any purpose of aggrandizement; they do not expect that the few hundred thousand men which they are capable of bringing into the field will ever decide the fate of Europe; but they intended to create an army and a navy of such strength that any enemy who should wish to attack the small country would be obliged to reckon the cost before he dare to make the attack.

They made a soldier of every man capable of bearing arms. They prepared the principal part of the country for immediate inundation, and then quietly made it known to their neighbors that they would regard a nation which should cross their frontier as their enemy.

The result thus far has been beneficent to the small Kingdom. The conflagration has spread to all parts of Europe. This little triangle of sand and marshes, situated right in the middle of the terrible upheaval, has been spared. Unless unforeseen circumstances shall happen, Holland will not take part in the war. The outlay of countless hard-earned millions and the willingness of all men to submit to a few months of drill has accomplished this feat.

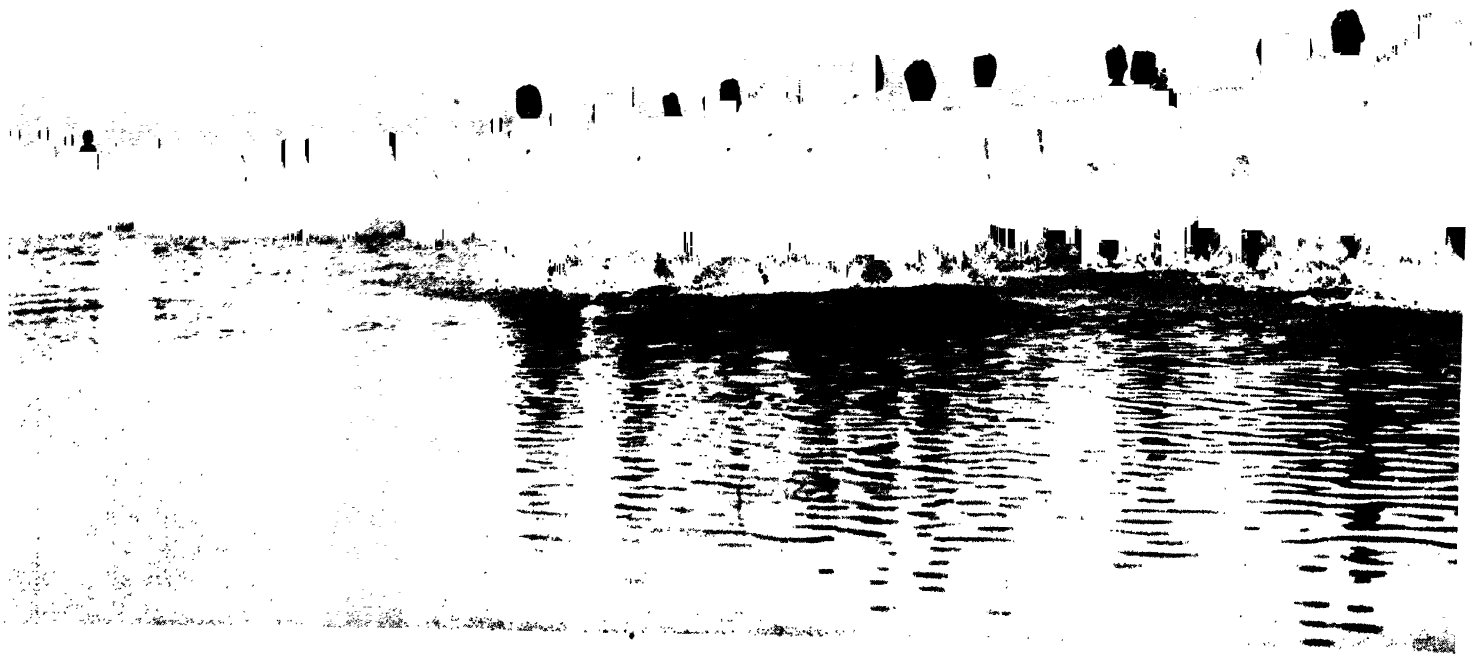
Together with Switzerland and Denmark and Norway and Sweden, Holland owes its salvation to its own labors and sacrifices. It was a lesson which was not easily learned, but which will not lightly be forgotten after the terrible example of Belgium.

THE TRAGIC LESSON BEQUEATHED BY OLD HOLLAND

It is a sad reflection that just one hundred years ago Holland was in the same position in which her southern neighbor finds herself at the present moment. The old Dutch Republic of the sixteenth and seventeenth centuries had grown too rich in the eighteenth century. Millions for tribute, but not a cent for defense had become the watchword of the self-contented rentiers, whose grandfathers had amassed fortunes and who were not willing to spend a penny of their comfortable dividends upon either an army or a navy. Whenever they needed soldiers they hired a few regiments of Germans or Scotchmen. They allowed the ships of the navy, which had made their country the leader of Europe's foreign policies, to rot in the harbors, and for over forty-three years did not spend a guilder for the maintenance of the fleet.

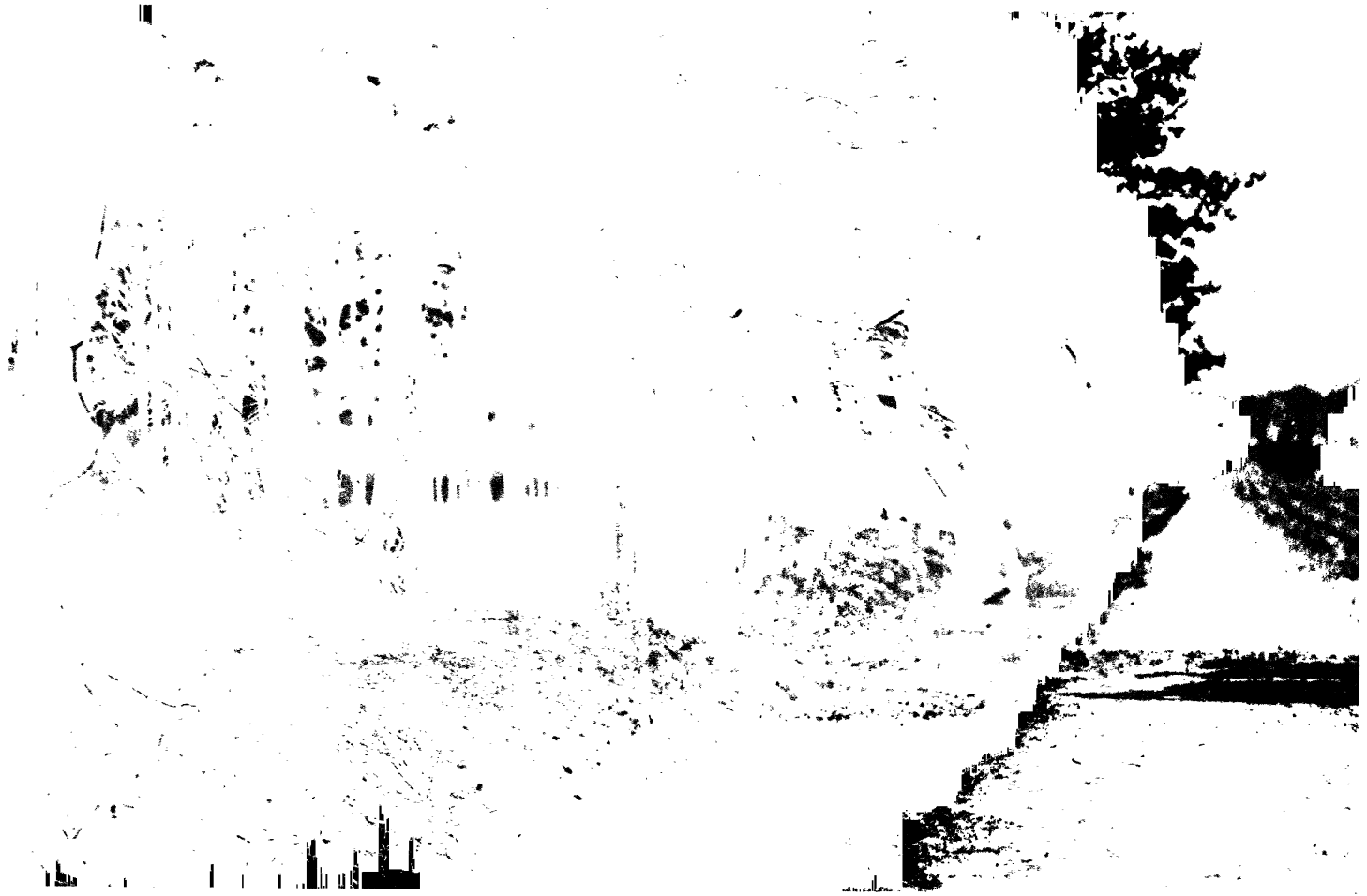


DUTCH CAVALRY IN A PRACTICE MARCH



DUTCH ARTILLERY FORDING A SMALL RIVER

This is the only regiment which retains the old Napoleonic bearskins. It is a regiment of light artillery. It operates in the territory which is most exposed to attack, and its duty is to defend the rivers which run toward the North Sea and the Zuyder Zee.



A MOUNTED MACHINE GUN CARRIED BY TWO HORSES THAT JUMP AS ONE

In modern warfare machine guns have become almost as plentiful as rifles. The cavalry horses of Holland are trained jumpers, for to be most useful in the defense of the country they must be able to jump canals readily.

Several times the government of the Republic was called upon to fulfill the stipulations of some ancient treaty of alliance and to provide her friends with a certain number of ships and a few thousand men. Instead of sending ships, the Dutch Government produced an unlimited checkbook, made some sort of humiliating compromise, and bought herself out of all honorable engagements.

When the Dey of Algeria captured Dutch ships trading in the Mediterranean, he was offered an annual bribe if he would desist from bothering Dutch commerce. When British privateers burned Dutch fishing smacks off the coast of Zeeland, the people rushed into print and denounced the wicked Englishmen. But nobody thought of fighting these enemies as their fathers had done.

It was a sad story. The less we say about it the better. The reward for this policy of indifference and cowardice came in the year 1795. In less than a week the entire Dutch Republic of mighty memory fell into the hands of the French revolutionary hordes. Holland in the sixteenth century had been a large business house defended by a mighty fleet. In the eighteenth century it became an opulent savings bank, which refused to provide for a new door and new shutters because "it would cost too much." The French revolutionary soldiers, soon followed by Napoleon the First, pushed their way into the treasure-house of this feeble Commonwealth, declared it to be part of the French Empire, removed everything of any value, and after twenty years of systematic pillaging they turned the erstwhile powerful Republic into a geographical idea, without men, without money, without hope, and without courage.

When finally, on the nineteenth of October, 1813, old Blücher, cursing and swearing at the Corsican usurper, forced his way into the city of Leipzig and turned the French defeat into a rout, there were not more than a dozen men in the former Republic willing to risk their lives for the liberty of their country. It is a matter of record that during the first week after the flight of the French troops from Holland the regular Dutch army did not count more than 651 men.

From that moment, however, there was a steady improvement. The Kingdom of the Netherlands was formed, under the leadership of the old House of Orange. Every man capable of bearing arms was drafted into the national defenses, and much of the ultimate success of the battle of Waterloo was due to the Dutch forces at Quatre Bras, who engaged the superior advance guard of Marshal Ney until the Duke of Wellington had put his army into battle array.

EVERY BOY IS TRAINED TO DEFEND HIS COUNTRY

From the year 1815 on, every boy of nineteen in the Kingdom has been obliged to prepare for military service. It is not desirable to give the exact number of soldiers in the army which has been mobilized since July of the year 1914. But in a general way we can state that every male being in the country who is of good physical condition and who can walk with a gun across his shoulder has in some direct or indirect fashion given part of his time and his services for the benefit of his country. The old law, which made an exception for only sons, was rescinded several years ago. The Napoleonic system, which allowed rich young men to buy themselves out of the army, has been abolished. The army is now a democratic school, in which classes are thrown together for one common purpose.

Every young man who has reached the age of 19 years appears at his special garrison. For a full year he is instructed in the rudimentary principles of a soldier's trade. If he cares to enter the special service of artillery, aircraft, or submarine work, he will have to spend one or two years more. In that case, however, he learns a useful trade which will help his chances in his future work.

When he has been taught his business he goes back into private life. Except for a short annual maneuver, he has nothing further to do with the military system until a sudden emergency shall call him back to the colors.

THE NORTH SEA IS HER BEST ALLY

Holland can hope to accomplish great things with comparatively weak forces,



THE DUTCH CYCLE COMPANY ON THE MARCH

In addition to its infantry, artillery, and cavalry, the Dutch army has a "bicycle brigade," a company of men who are noted for their ability as riders and marksmen. It is their duty to destroy all bridges in case of invasion (see page 617).

because it has an ally, mightier than either steel or iron or high explosives. That ally is the North Sea. The Kingdom of the Netherlands is a mud-bank conquered from the ocean. Open the dikes which defend the land against the angry aggression of the sea and the country will disappear beneath 3 feet of water. This excellent method of defense was known to our ancestors. It was first used in the year 1572. In the month of April of that year a number of starving Dutch revolutionists captured a small Dutch town named Brielle. The Spaniards tried to reconquer it. The Hollanders opened the locks of the Meuse. The water came and the Spaniard went.

A few years later the town of Leiden, situated in the heart of the country, was delivered from Spanish siege by a fleet of Dutch catboats and flat-bottomed scows sailing across an impromptu lake and storming Spanish forts after a charge of swimming and wading sailors.

A century later the entire military power of Louis XIV of France was turned against the Dutch Republic. The French army, fresh from victories in many parts of Europe, came to grief when William III inundated the principal part of the Province of Holland and threatened to drown the invader.

In the year 1815, when the new Kingdom of the Netherlands was definitely reconstructed, it was decided to use the water in a scientific fashion for the defense of the country. The eastern part, flat and covered with heath, was to be left open to invasion. The heart of the country, 9 feet below the level of the sea, was to be turned into an ingenious fortress.

At the present time the old idea has been continued with but small changes. A strong force of cavalry and infantry provided with bicycles is left for the defense of this territory. These men must try and stop the invading power as long as possible. It is their duty to destroy all bridges and to dispute any attempt of the enemy to cross the big rivers.

HOLLAND IS SURROUNDED BY MOATS

Meanwhile the regular army has retired behind the system of fortresses and inundations, which are all together designated as the "Waterline."

The "Waterline" consists of two parts. The first line of defense runs from the Zuyder Zee due south to the lower parts of the rivers Meuse and Rhine. It cuts off the provinces of north and south Holland and half of the province of Utrecht. It creates a large artificial lake, from 6 to 10 miles wide, which covers all roads, canals, bridges, railroad tracks, and fences.

In many places where an attack might be expected barbed-wire fences have been constructed in such a fashion that they shall be completely covered by the water. The few trenches which guard this line of defense on the east can be turned into ditches. It will offer the forlorn aspect of a large tract of flooded territory. The thousands of trees, the network of fences just below the surface of the water, will make navigation an impossibility.

At irregular intervals there are more than 40 little islands armed with heavy guns. They cover all the roads which in normal time cross this territory, and they know the exact range of every foot of ground (or rather mud) in the waterline.

Behind this first line of defense stretches the second one, which is also the most important. It consists of another group of inundations and some forty-eight fortifications, and forms a broad circle of defense for the town of Amsterdam. Here the strength of the country has been concentrated, and ever since the beginning of the present war every lock and every dike has been guarded. Within six hours this territory would be ready to resist an invasion. Within twelve hours thousands of acres of the most fertile grazing grounds would be covered with four feet of salt water. After a day and a night neither man nor machine could cross the artificial sea surrounding the heart of the country. The much dreaded shells of the heavy siege guns would cause a big splash, but would do no damage.

This is not a mere supposition written in a moment of patriotic self-glorification. Our statement is based upon the German experience along the Yser front. The



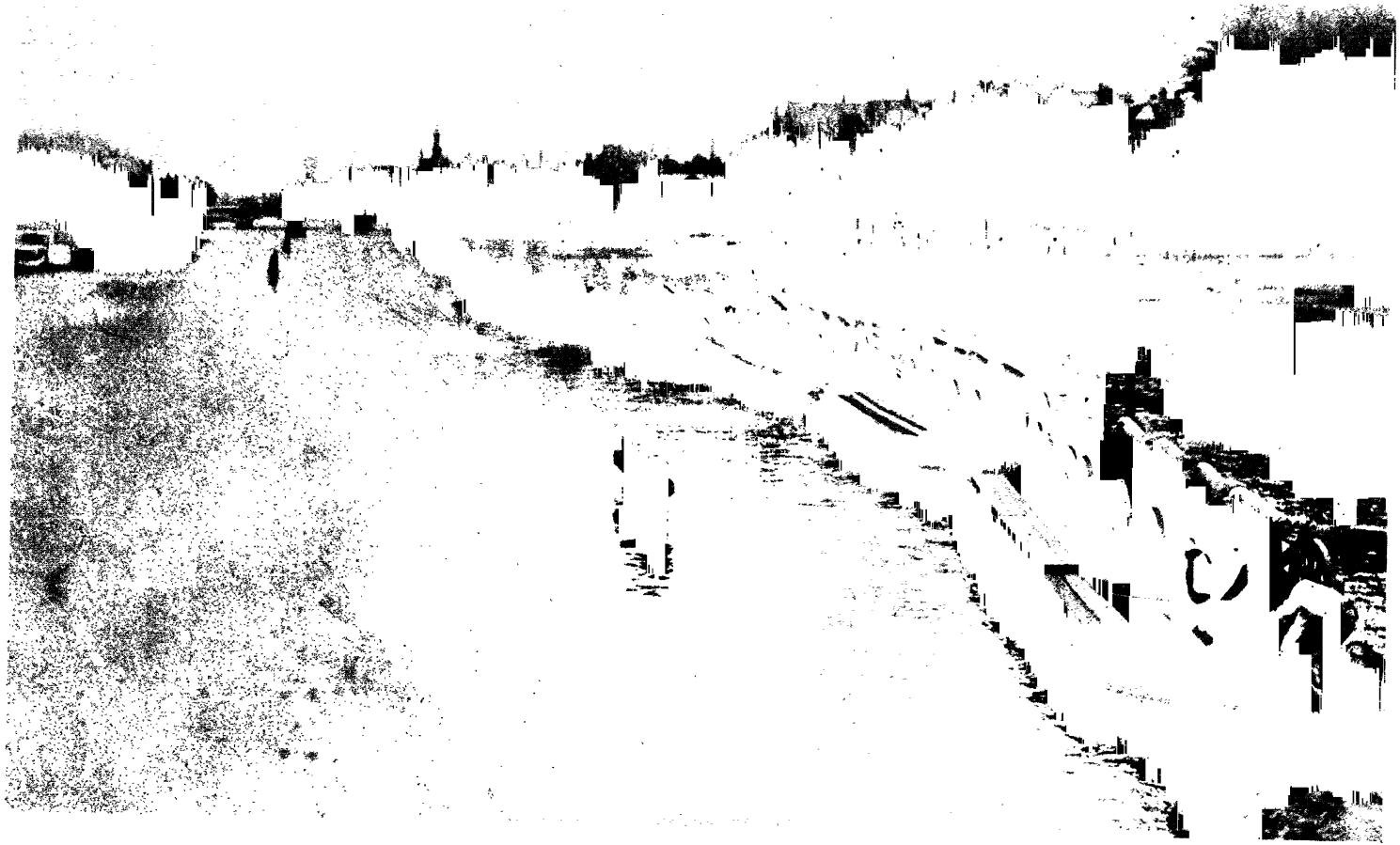
DOG AND MAN ALIKE MUST PULL IN DE ENSE OF HOLLAND'S DUNES

The Dutch sowed a sand grass upon the dunes and bound their shifting sa ds; and now the dunes are ramparts of defense. They dammed ba k the seas and, foot by foot, won much of their territory from the ocean, which nevertheless protects them from human foe, because no nation ' s soldiers tall enough to keep their heads above water should the sturdy Holla nders call the seas to their aid.



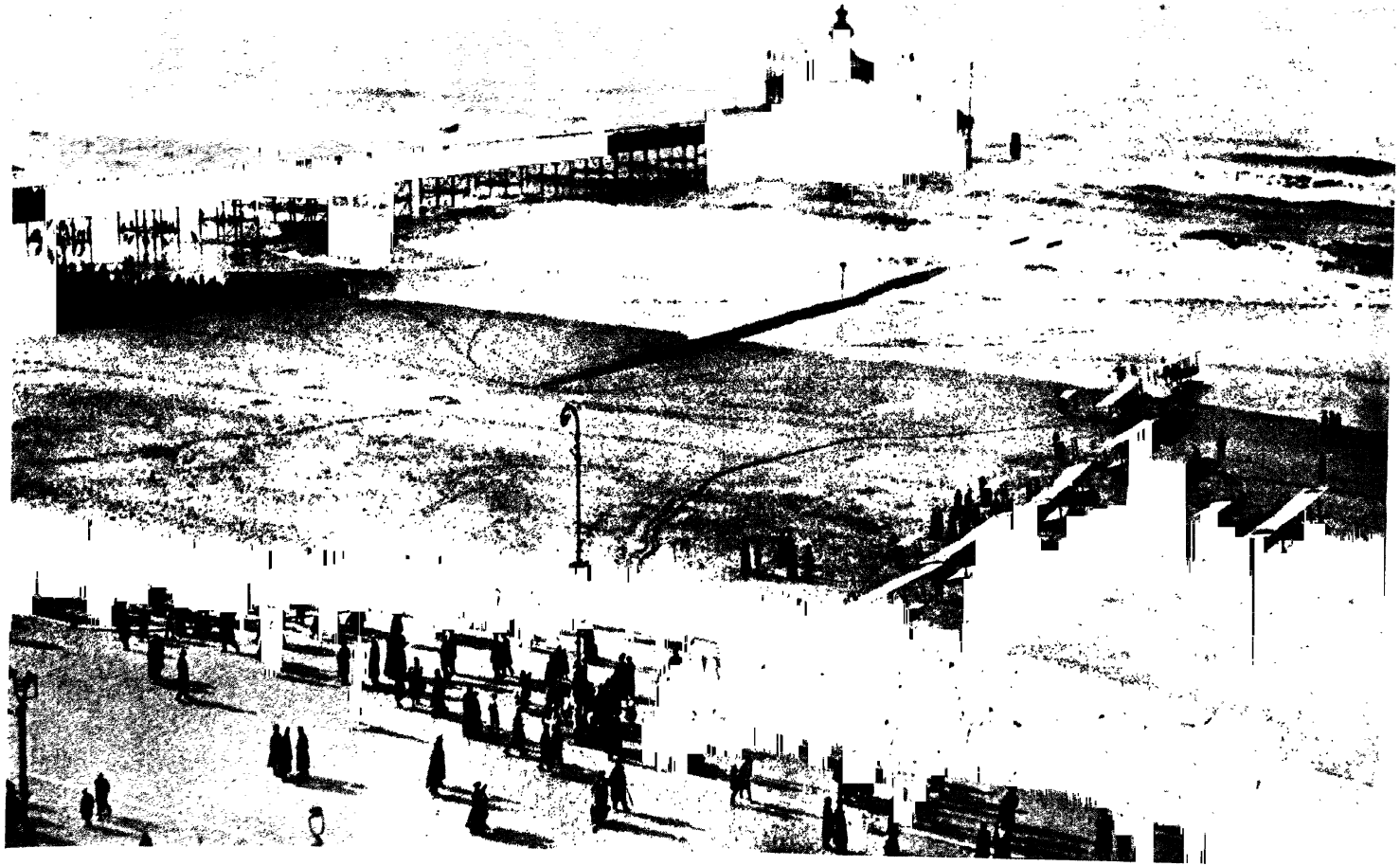
WAR DOGS AT WORK IN HOLLAND

Dogs have always been used in the low countries for the transportation of light carts or the towing of ships in canals. These machine-gun dogs, a special variety which is being bred for this sort of work, resemble Eskimo dogs in their vitality and high spirits. They keep cheerful and good-natured long after the human machine has yielded to fatigue.



HEAVY ARTILLERY PASSING THROUGH THE CANALS OF HOLLAND

The coast is defended strongly, the works barring entrance to the Zuyder Zee and to the Amsterdam and Rotterdam canals being of the highest art in military engineering



A PORTION OF HOLLAND'S AËRIAL FLEET AT SCHEVENINGEN

Just as Switzerland has remained an island of peace in a sea of war, so Holland remains an oasis of happiness in a desert of carnage

southern part of Flanders, in which the heaviest fighting of the year 1914 occurred, greatly resembles the watery part of the Netherlands. It is a region of low pastures and high skies, ditches, rain, and salt spray. The opening of the locks at Nieuport flooded the land on both sides of the Yser Canal. Behind this the remains of the Belgian army were able to withstand the first shock of the German army marching for Calais.

After almost two years of patience and ingenuity, the Germans have not advanced a single yard against this stagnant lake, which is now the burying ground of many thousand young and brave fellows. The ordinary methods of war were of no avail. Boats, floats, complicated rafts have all been tried and have been given up as useless. The remaining part of Belgium is safe behind this bulwark of our faithful old ally, the North Sea.

The people of the Netherlands know that they will exist as an independent nation just as long as they are able to take care of themselves. For this purpose they have made it the duty of every man to give part of his time to the service of his country. For this ideal they are willing to sacrifice the better part of their territory and to surrender it temporarily to the waves rather than allow an occupation by the force of an enemy.

Because of their industry and foresight in preparing themselves for the unexpected, no hostile force has crossed the frontiers of their tiny country during the last one hundred years.



Photograph by George R. King

A SCENE IN SIEUR DE MONTS NATIONAL MONUMENT, MT. DESERT ISLAND

A wild sheet of water that fills the deep glacial gorge of Indian Pass and lies between the Gates of Eden



Photograph by George R. King

VIEW TAKEN ON THE BEACHCROFT PATH, MT. DESERT ISLAND

Built as a memorial to an island home and leading boldly up the pine-clad ledges to Huguenot Head and a glorious ocean view

FIRST NATIONAL PARK EAST OF MISSISSIPPI RIVER

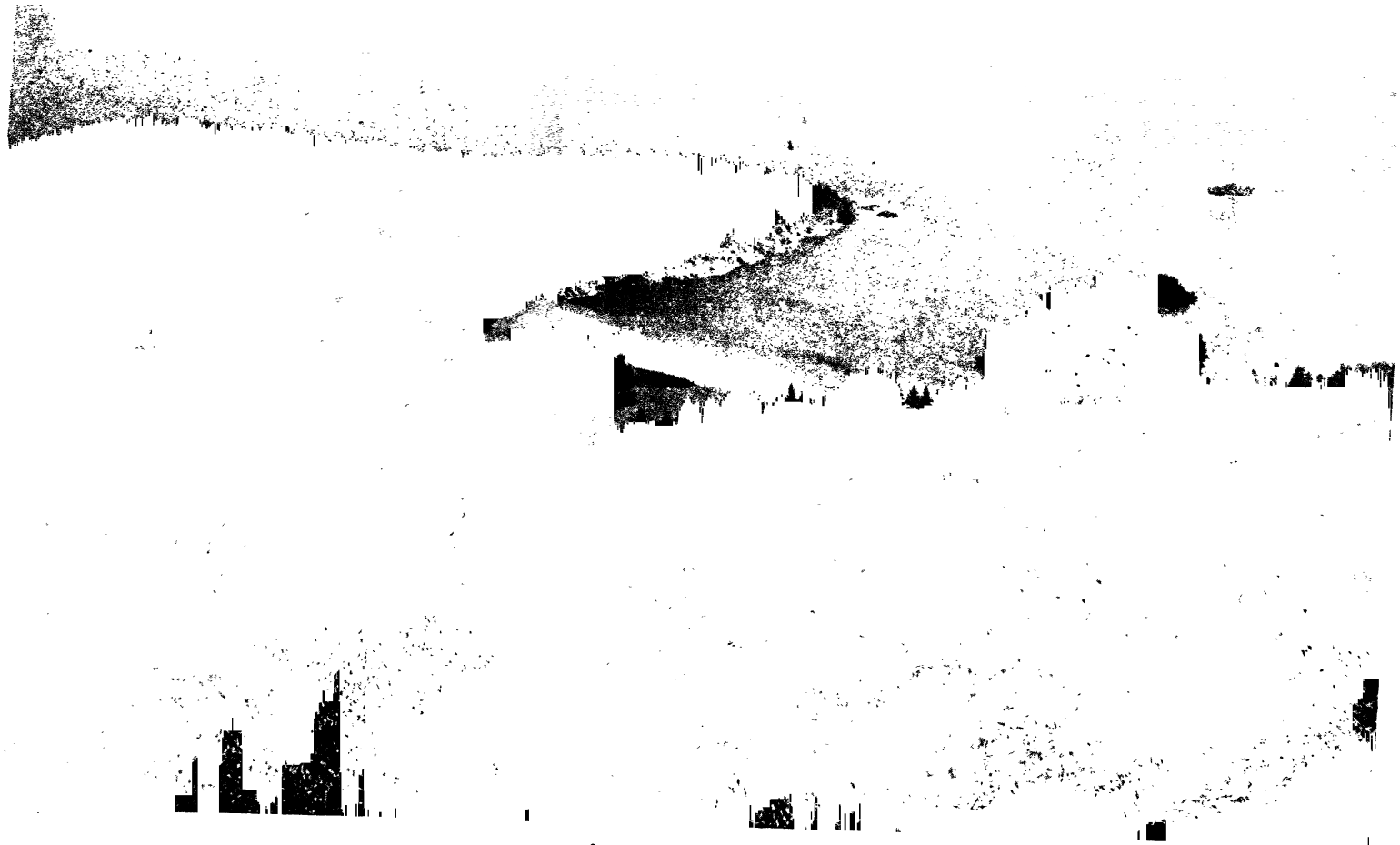
In the July issue, 1914, of the NATIONAL GEOGRAPHIC MAGAZINE appeared a group of articles by Charles W. Eliot, President Emeritus of Harvard University; George B. Dorr, E. H. Forbush, and others, telling of the intended gift to the Nation of a National Park upon Mount Desert Island, the culminating point of the beautiful coast scenery of Maine. After two years of further work upon the donors' part, spent on the improvement of boundary, approach, and title, this gift of unique and splendid landscape character has been accepted by President Wilson, and now stands dedicated forever to free public use and to purposes of bird and other wild life conservation, under the title of the Sieur de Monts National Monument.

Its acceptance marks the beginning of a new era in our National Park development, it being the first National Park—apart from battle monuments and forest reserves—to be established in the vast and wealthy eastern region of our country—the region of early occupation, of densest population, and greatest public need.



Photograph by George R. King

VIEW FROM THE SUMMIT OF NEWPORT MOUNTAIN: LOOKING NORTHWARD ACROSS FRENCHMANS BAY TO THE GOULDSBORO HILLS



VIEW OF GREAT HEAD AND THE SAND BEACH, TAKEN FROM THE HOMANS GIFT, MT. DESERT ISLAND

Photograph by George R. King

A superb headland bounding on the south the National Park. The beach below and rocky shore beyond were bought some years ago by the late J. Pierpont Morgan and given to one of his daughters, whose summer home it is, but who generously leaves the old-time path across them open to the public.



Photograph by George R. King

THE PRECIPITOUS GRANITE CRAGS OVERHANGING SIEUR DE MONTS SPRING

Our first National Park east of the Mississippi River, the Sieur de Monts National Monument, was the first land to be visited, described, and named by Champlain when sailing under de Monts' orders in the exploration of the New England coast.

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THE NATIONAL GEOGRAPHIC MAGAZINE

LITTLE-KNOWN SARDINIA

BY HELEN DUNSTAN WRIGHT

THOSE who have taken the Mediterranean route have at least had a glimpse of Sardinia from their steamer a day out from Naples. The island is in sight for some hours, and, if the steamer passes sufficiently close, a bold rocky coast can be seen on which Roman outlook towers remain similar to those scattered along the south shores of Spain. The tourist seldom includes a trip to Sardinia in his travels, as neither of his advisers, Thomas Cook nor Baedeker, recommends it to him. It, however, is one of the few foreign fields that has not been overrun and overfed by the tourist, and in many of the villages a traveler is still regarded as a guest and not as prey to be pounced upon.

Some day, when tourists are tired of taking the tours laid out for them by the guide-books, perhaps they will break away from the continent and set sail for Sardinia, especially if they are not traveling just to enjoy hotel comforts. One can rent a good automobile at Cagliari, and a week spent touring around the island would probably leave the pleasantest of recollections and an experience long to be remembered.

Sardinia can be reached by an eight hours' night voyage from Civitavecchia, the port of Rome, to the north end of the island. The crossing on the mail steamer is quite comfortable, but the knowledge that one must get up at five the next morning is rather appalling. The beauty of the sunrise over the sheer cliffs and craggy isolated rocks of Golfo degli Aranci compensates, however, for this inconvenience and for the cup of bitter black coffee which comprises the breakfast.

As soon as one lands, a refreshing fragrance in the air is noticed—a perfume characteristic of Sardinia—not due, certainly, to orange trees, as is suggested by the name of the port, there being none in this district, but to the many wild herbs and shrubs all over the island.

The first couple of hours' journey down the island is over a rough, rolling country made up of granite and resembling parts of Arizona or Montana. This apparent waste land is used for pasturing goats, which feed on the shrubs. Here, as over most of the island, one finds the white flowering cystus, bright yellow ginestra, rosemary, a mass of blue when in blossom, and pink heather; also arbutus with bright yellow and red berries, thyme, juniper, and other shrubs.

THE SWITZERLAND OF SARDINIA

Excepting the eucalyptus and pine planted near the stations, there is a noticeable lack of trees along the railway routes. Among the mountains, however, which occupy the eastern half of the island and occur to some extent along the western coast, there are important forests of oak, ilex, cork, and wild olive; also areas reforested with pine and chestnut trees. In the mountainous areas of the island are many fertile valleys.



Photograph by C. W. Wright

GIRLS AT DORGALI

Note the queer bonnets worn, made of many-colored silk

The scenery here compares favorably in grandeur with that of many countries of the world. The finest scenery is among the Gennargentu Mountains in the Barbargia Range, the highest peak being 6,233 feet above sea-level; on it there is usually snow from November to April. This region is called the Switzerland of Sardinia. In the other ranges are many picturesque peaks, as, for instance, Monte Albo, a group of limestone mountains with practically no vegetation on their slopes; so that the white mountains and the blue Mediterranean at their feet offer striking contrasts.

But, to return to the railway route, at Chilivani, one-third of the way down the island, is the junction of the road that goes west to Sassari, the capital of the northern province of Sardinia. This city is situated in the midst of a well-cultivated area, with groves of olive, almond, orange, and lemon trees and orchards of apples, peaches, cherries, and other fruits. The railway continues to the coast of Alghero, an interesting old Spanish port, at one time surrounded by a high fortified wall. It is here that Admiral von Tirpitz owns a large agricultural farm and has a villa, and where, at the beginning of the war, the Germans were suspected of having a base for supplying submarines.

To the south, about half way down the island, at Macomer, is another branch road to Nuoro, a distance of 35 miles and the center of a mountainous district, the Barbargia, which was at one time said to be the home of the famous Sardinian brigands. These are practically "extinct" now, although occasionally one hears of a man who has murdered a neighbor or a member of his family for some personal wrong and, in order to escape the carabinieri, or national police, flees to the mountains and lives as best he can, sometimes stealing a lamb or a goat from a shepherd or stopping a lonely traveler to ask for food or a few soldi. Unfortunately, the general impression outside of Sardinia, even in Italy, is that



Photograph by C. W. Wright

GATHERING THE WHEAT

Harvesting machinery is seldom seen in Sardinia. The head-dresses of these two reapers are peculiar to the island. This type of cap not only furnishes a covering for the wearer's head, but is an improvised lunch bag, from which he will abstract a loaf of bread at the noon hour. At night it serves as his pillow.

the island is more or less overrun by bandits; this is not true, and a traveler on the island today is even safer than he would be in southern Italy or Sicily.

MEDIEVAL TOWERS CROWN CAGLIARI'S HILLS

Macomer is the center of the region where many fine horses are bred for the army, as are also the small ponies used in Naples. After passing this town, the railroad descends to Oristano, on the west coast, noted for its pottery and particularly its delicious pastry and almond sweets. The road then runs diagonally across a valley, from 10 to 15 miles wide, which extends down to Cagliari, at the southeastern end of the island.

Cagliari is the principal port of Sardinia, and is often visited for a few hours by tourists taking the weekly steamer from Genoa and Livorno to Tunis. The bay of Cagliari is most impressive. On the right and left as you enter are hills, with mountains in the distance, while rising up from the lowlands directly opposite the entrance is the city, on a rocky hill 400 feet high. The top of this hill is encircled by a massive wall, built by the Pisans in the thirteenth century. At two of its angles rise the towers of the Lion and the Elephant, but of the tower of the Eagle, which completed the triangle, only the base remains. In the center of these fortifications is the old town and the cathedral. On the slopes of the hill outside the walls is built the modern city.

Surrounding Cagliari are shallow bays, which extend inland for many miles, and are of interest because of the government salt recoveries, where huge mounds of salt, 20 to 40 feet high, can be seen on the flats. In the spring flocks of flamingoes and other birds congregate on these lowlands and add to the beauty of the



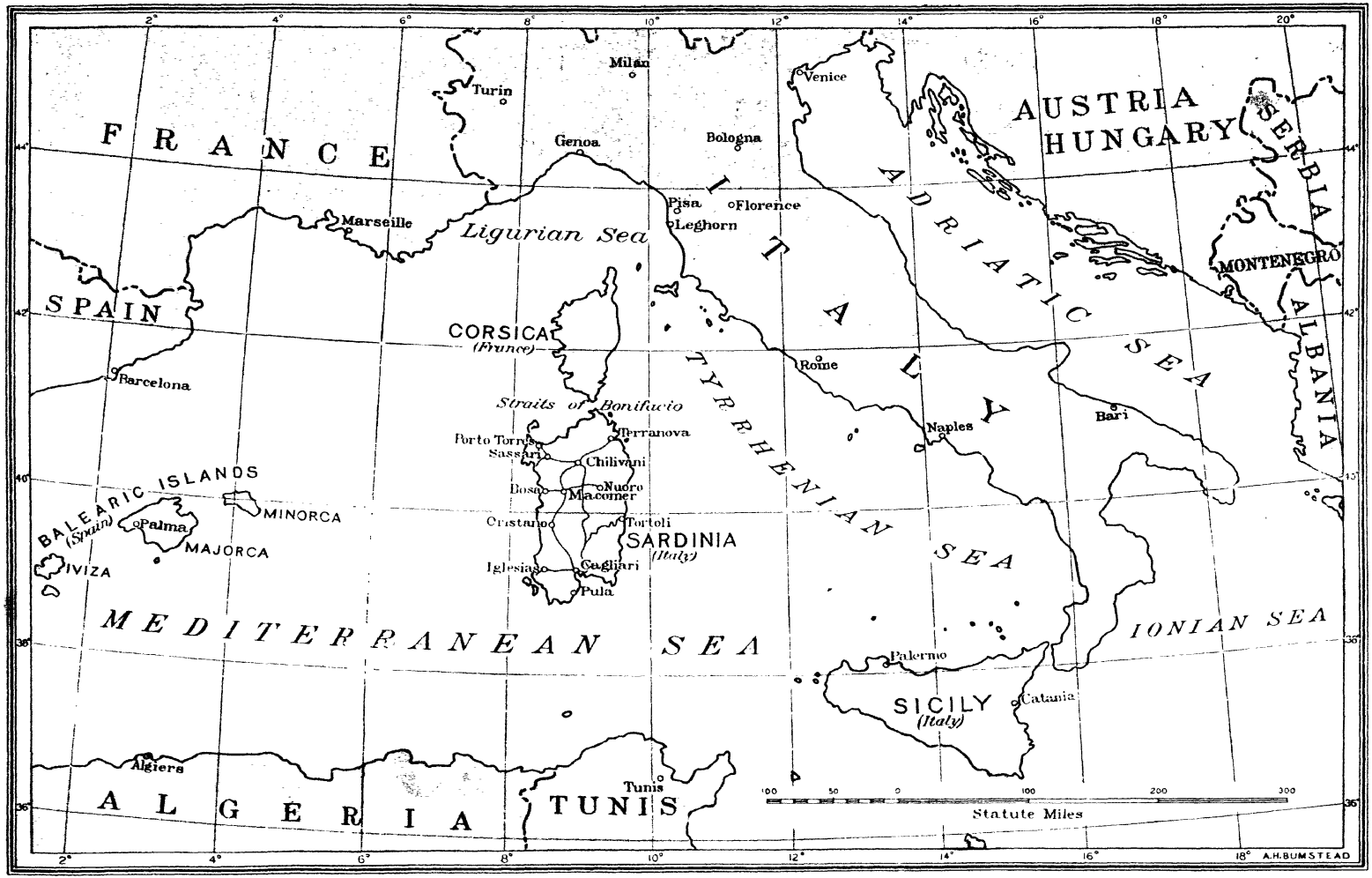
CAVALCADE OF HORSEMEN AND HORSEWOMEN STARTING ON A PILGRIMAGE TO A SMALL CHAPEL IN THE COUNTRY

The banners carried by the leaders and the bright colors of the costumes make a striking picture. The saddle-bags are usually well filled in preparation for the feast



TUNNY FISHING AT PORTO TORRES

We get the word "sardine" from Sardinia, but we get few sardines, for practically all of this "catch" is consumed locally. The tunny fisheries, on the other hand, are important and profitable. The Genoese control this industry on the island, for the Sardinians are not a maritime folk.



SKETCH MAP SHOWING SARDINIA AND HER RELATIVE POSITION TO ADJACENT MEDITERRANEAN COUNTRIES



SARDINIAN MINERS ON THEIR WAY TO WORK

Fifteen thousand natives find employment in the mines of the island. The center of this industry is in the southwestern corner, in the vicinity of Iglesias. Lead and zinc are the principal minerals, but silver, iron, antimony, coal, and copper are also produced. During the Spanish occupation of the island the mines of Sardinia were abandoned, for the soldiers of Aragon and Castile had discovered the fabulous wealth of the Montezumas and the Incas in the New World.



Photograph by C. W. Wright

THE COSTUMES OF ARITZO, CENTRAL SARDINIA

Just as the girls of the various towns and provinces of Holland are to be distinguished by the peculiar form of their quaint head-dresses, so the girls of Sardinian villages are known by the combination of colors in their costumes. The women and children dress alike—full skirts, usually dark red; white waists with full sleeves, and short bright red or bright blue jackets, open in front or laced around the waist. In some districts the pattern of the apron is the distinctive feature.



Photograph by C. W. Wright

GREETING THE TOURIST WITH A SMILE

Politeness is one of the striking characteristics of the Sardinians. As the traveler rides through a village the women, children, and the old men sitting at the doorways rise and cheerily cry out "Buon viaggro."

scenery. The land around the lagoons is especially fertile and well cultivated with truck gardens and vineyards, from which a very large quantity of wine is made.

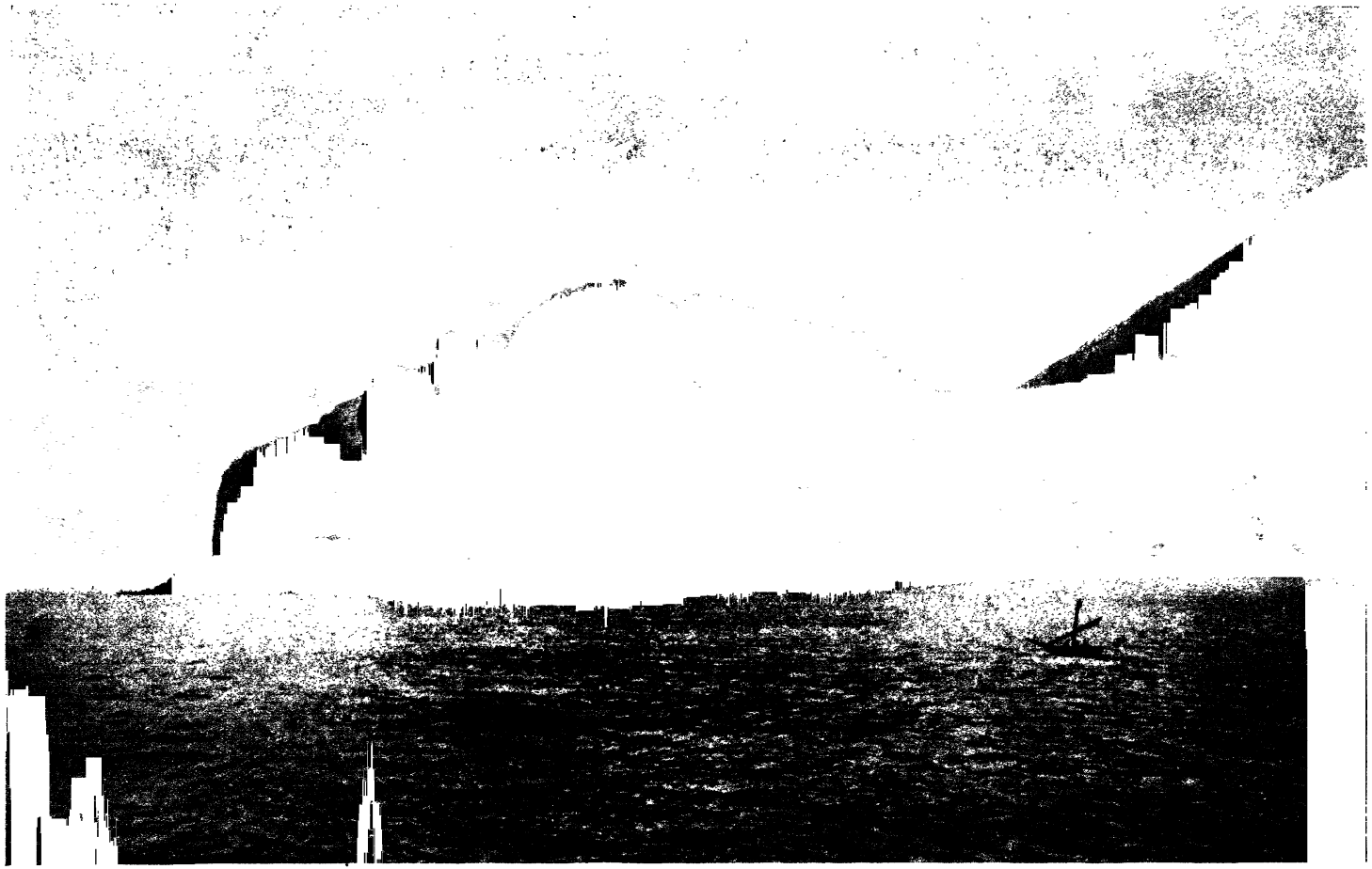
Cagliari, the largest city on the island and the capital of the southern province, has about 53,000 inhabitants. The entire population of the island is estimated at 796,000, a density of population of 85 per square mile; this is a much lower figure than in any other part of Italy.

Among the objects historically interesting in Cagliari are rock-cut tombs on the hillside below the Castello. These are probably of the same period as the "nuraghi," the famous prehistoric remains in Sardinia, and some may have been enlarged by the Romans into the tombs which still exist, well preserved and with Latin inscriptions on their walls.

STRANGE RELICS OF THE BRONZE AGE

Of the Roman period an ampitheater remains. This is on the side hill to the west of the city and is fairly well preserved, with the passages under the tiers of seats. The work of the Pisans in the cathedral was begun in 1312 A. D. and finished by the Aragons in 1331, but later partly rebuilt by the Spaniards in 1669. Among the modern buildings is a beautiful city hall, recently completed; a university with its library, which has a valuable collection of manuscripts, among them a code of laws made by Eleanora of Arborea, who was a ruler of a part of Sardinia when it was divided into four provinces under the Spaniards. The southeastern corner of the old fortifications has been remodeled to form a "piazza" above the city. Here concerts are held at midday on Sundays during the winter months and on summer evenings. It is the fashionable promenade, as is also the Via Roma, a boulevard along the edge of the bay.

Throughout Sardinia prehistoric monuments are prominent in the shape of



A VIEW OF THE ROCKY COAST NEAR THE NORTH END OF THE ISLAND

Cape Ferro is near the naval base of La Maddalena, on the northeast corner of Sardinia. Some miles south of this rugged point is the well-protected Gulf of Terranova and Golfo degli Aranci, where the traveler lands on the island after a night's voyage from Civitavecchia, the port for Rome.



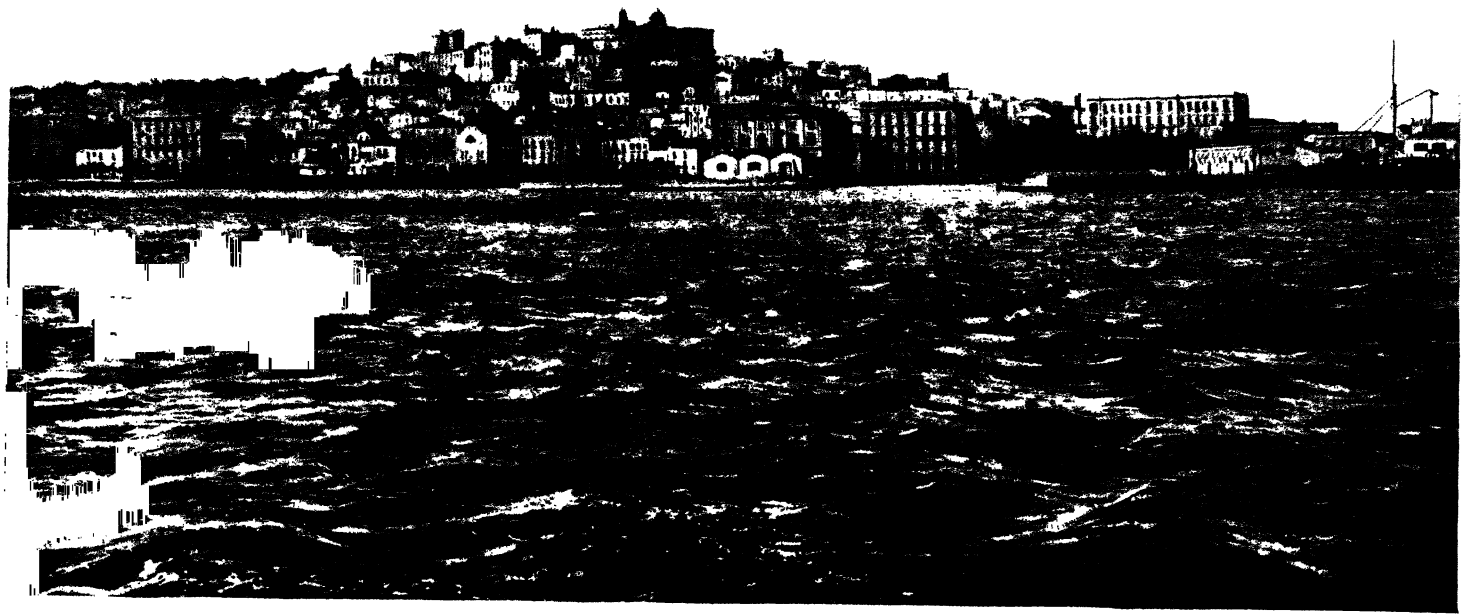
A DOMESTIC SCENE IN SARDINIA

Many of the people of the island are victims of abject poverty, but their condition is not due to lack of industry. The styles never change among the women, who wear the native costume; so it repays the seamstress, the weaver, and the embroidery expert to make garments that will last a lifetime, and can then be handed down as heirlooms for rising generations.



THE COSTUME OF NUORO

The large white sleeves beneath the slashed sleeves of the jacket; the full, short skirt and close-fitting trousers, are typical. One would think the man had stepped from his place in a pageant of the Middle Ages instead of being garbed in this customary costume for feast days.



A PANORAMA OF CAGLIARI FROM THE HARBOR

The principal city of Sardinia is this town of 53,000 inhabitants. It was founded by the Phœnicians and has been the scene of many striking episodes in the history of the island. In the year 1000 it was the stronghold of the Saracen chief Musat, who, after many years of war, was finally driven out by the Pisans, the latter having been promised the island by Pope John XVIII provided they evicted the Mohammedans.



A YOUNG MARRIED COUPLE OF IGLESIAS

The Sardinians have a high regard for womankind. They are a vigorous, hospitable, grave, and decorous mountain race, suspicious of all innovations. The silver buttons and voluminous trousers of the bridegroom are typical.

truncated cones about 30 feet in diameter at the base and built of large rough blocks of stone about 2 feet high and of varying lengths. These towers are the "nuraghi" belonging to the Bronze Age and show that the island must have been well populated in the centuries antedating the Christian era. The entrance to the "nuraghi" usually faced the south and served to light the circular room within, as did also a door opening to a spiral staircase built in the walls and leading to a chamber above the ground floor. Few of the "nuraghi" have the roofing preserved entirely, so that we no longer see them in their full height or original cone shape. Some have two or three chambers on the ground floor with niches in the walls, probably for household gods.

These towers were undoubtedly forti-



A LOVE SONG ON THE LAUNEDDA

This Sardinian musical instrument bears a striking resemblance to the pipes of the ancient Greeks. The serenader is wearing a sheepskin mantle, which, in addition to being his "Sunday best," is his talisman to ward off fever.



A SARDINIAN MAIDEN

Not only in their features, but in their language, do the natives retain traces of the many races which have occupied the island through the centuries—Phœnicians, Carthaginians, Romans, Saracens, Italians, and Spaniards. Many dialects are spoken, but Italian is now taught in the schools, and the men acquire the official language during their period of compulsory military service.



Photograph by C. W. Wright

THE COMMUNITY LAUNDRY TUB

Every day is wash day in Sardinia, and the public fountain takes the place of the village well of the Orient and the sewing circle of the Occident as a social center

fied habitations. They are usually situated in commanding positions at the entrance to tablelands, near the fords of rivers, or on almost inaccessible mountain peaks, and within signaling distance of one another. Traces of at least 5,000 "nuraghi" have been found.

The ancient tombs of the inhabitants of the "nuraghi" are usually found near them. These are called the "tombs of the giants," and are chambers 3½ feet wide and from 30 to 40 feet long, with a roof of flat slabs of rock and with the sides made of the slabs or of rough walling. The bodies were probably arranged in a sitting position. In front of the tombs are circles about 40 feet in diameter, surrounded by stones; these were, no doubt, used for sacrifices and burial rites.

Another type of tombs found in Sardinia is that of the small grottoes cut in the rock like those in prehistoric cemeteries in Sicily. In these tombs and in the "nuraghi" sarcophagi were discovered, generally of marble; also idols consisting of small bronze figures varying from 4 to 17 inches in height, images of dogs, bats, apes, and other animals—all most crude in workmanship and grotesque in form; medals, coins, vases, ornaments, arms, and articles of terra-cotta and glass. Most of these latter must antedate the Roman occupation. Some of these relics and similar objects, including articles of jewelry dating from the Roman occupation, can be seen in the Museum at Cagliari.

LANGUAGE REFLECTS MANY RACES

The Phœnician settlement is the earliest of which there is any accurate knowledge. Sardinia was said to be the grain-producing center of the Carthaginians about 500 B. C. The Romans captured it in 238 B. C., and it was then noted for its supply of corn. The Romans built many towns and roads, and remains of their monuments, temples, and sepulchers



Photograph by C. W. Wright

A SARDINIAN SHEPHERD AND HIS FLOCK

The donkeys of the island are remarkably small, as this typical mount of the herder shows. The sheep are prized not only for their wool, but for their milk, which is converted into cheese and sold on the continent as the Roman product.



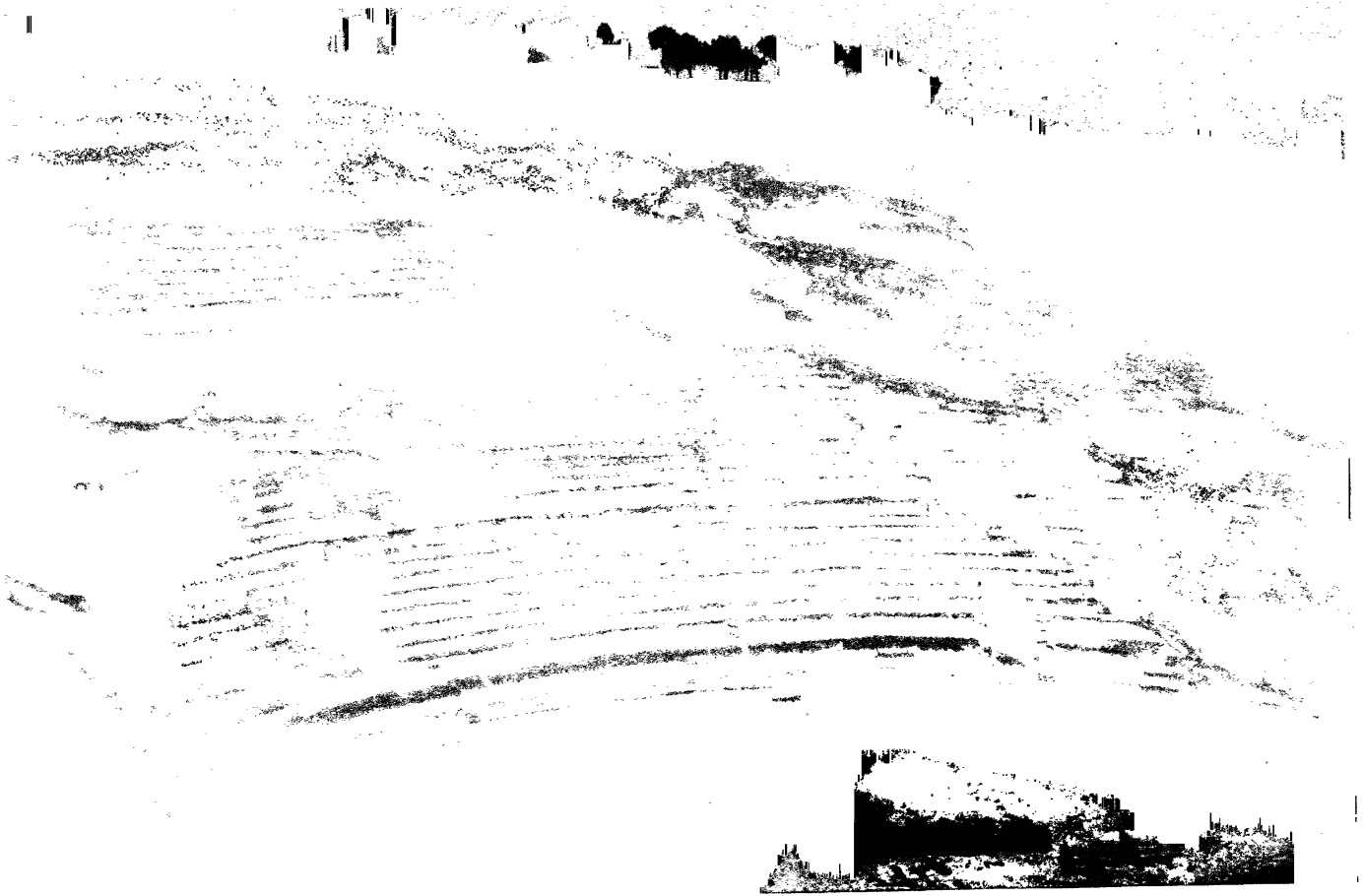
BENEATH THE TOMBS OF THE ANCIENTS

Viewed from a distance, these holes in the mountain side resemble natural caves, but they are the rock-hewn mausoleums of the "nuraghi," and are known as the "domus de gianas," or houses of the spirits. In contrast to these burial places are the "giants' tombs," crude sarcophagi of the prehistoric inhabitants of Sardinia, from 30 to 40 feet in length and 3½ feet wide and high.



SARDINIAN BREAD, MADE ON FESTIVE DAYS

The bread is a pure white, of fine texture, and is kneaded for hours before baking. The fair bakers are wearing their most elaborate costumes, reserved for religious festivals and holidays.



REMAINS OF AMPHITHEATER, NEAR CAGLIARI

This extensive ruin, with its rock-hewn benches, is a relic of Roman occupation. Sardinia furnished more human victims for the games in the great capital of the ancient world than sports for its own people. It is recorded that Sempronius Gracchus, after quelling two insurrections of mountain tribes, took 80,000 Sardinian slaves to Rome.



Photograph by C. W. Wright

SHEPHERDS OF POVERTY-STRICKEN SARDINIA

One glimpse at this trio would be enough to send a shudder down the spine of a stranger who has feasted upon the out-of-date tales of bandit-ridden Sardinia, but these three cronies are harmless natives, who, in spite of their bitter fight against heavy taxes and the relatively high cost of living, never annoy the tourists by begging, as do so many of the people of southern Italy.

are still preserved. The Byzantines captured Sardinia from the Romans and held it until the tenth century, when the Saracens took possession, and were in turn driven out by the Pisans. There are traces of the influence of Pisa in the fine Romanesque churches which are still well preserved. In some churches the late Gothic architectural style shows Spanish influence, which came after the surrender of the Pisans to Genoa, and then to James II of Aragon. In 1708 Cagliari surrendered to the English, but in the War of Spanish Succession the island came under the rule of Austria. Finally, after more exchange, it was given to the Duke of Savoy, who acquired with it the title of King of Sardinia.

It is not strange that the language of the people should contain elements of the languages of all the races which have occupied the island. The dialects, of which there are five or six, are a mixture of Latin, Spanish, and Italian, with a little Phœnician and traces of other ancient tongues. In Alghero, on the west coast, pure Catalan is spoken; in some villages almost pure Latin; and in Carloforte, on the southwestern coast, the Genoese dialect prevails. Italian, however, is now taught in the schools to the children, while the men acquire it during their compulsory military service.

To get an insight into the life of the inhabitants of this isolated island, one should visit its villages. It is in the entire eastern half, with its mountainous valleys and villages, where the real Sards now live. Here one will find them good looking and in good health, generous, hospitable, honorable, and quite poor. Politeness is carried almost to an extreme. Often as one rides through a small village the women, children, and old men sitting at the doorsteps rise and wish you a "buon viaggio"; or if it happens to be



TWO-WHEEL TRANSPORTATION IN SARDINIA

During the era of Roman occupation nearly 1,000 miles of roads were constructed on the island, and some of these are still well preserved. Although small, the Sardinian oxen make good draught animals.

noon, some may wish you a "buon appetito." Even the young boys are taught to take their hats off when strangers pass by; and if one is in an automobile and happens to stop to get out his kodak, a crowd of youngsters seem to spring up around the car, all anxious to be in the picture. To refuse a cup of coffee or a liqueur when visiting the house of an inhabitant of a village is an act of great discourtesy, and even the poorest have some beverage to offer.

NATIVES EXCESSIVELY POLITE

Generally speaking, the peasants seem to be somewhat downtrodden and do not realize their just rights. We thought the attitude of the man in the following incident most unusual: When motoring along one of the straight roads down through the valley to Cagliari, we saw a man ahead on horseback. He jumped off in a great hurry and, holding the horse by the end of the reins, got down into the deep ditch at the side of the road. As the car came up he was so interested in probably the first automobile he had ever seen that he forgot his horse, which, unexpectedly, gave a jump down into the ditch almost on top of the man, upsetting him and his saddle-bags into the mud. When we stopped to examine the harm done and to help him up he was very gratified and most profuse in his apologies for having disturbed us, saying: "Excuse me, excuse me; it was all my fault."

The music of the Sards is characteristic; not all quick and vivacious like that of the Sicilians or other southern Italians, but monotonous and slow, resembling very much the music of northern Africa. Often a long song will be sung to one phrase of a melody, like a sorrowful chant. The accordion is a favorite instrument, and in the villages on Sundays or other festas most of the inhabitants congregate in the principal piazza and dance to its music. The men and women form in a circle and dance slowly forward and backward, some of the younger men adding more complicated steps, occasionally breaking away from the circle and dancing with their partners; but the whole effect is dignified and staid.

Each "paese" or village has its annual festival to celebrate the birthday of its own particular saint or some other church feast. The most renowned of these is the "festa" of "Saint' Efisio," the national feast of the island. The ceremony is in the form of a procession from Cagliari to Pula, a village 9 miles away, with the return to Cagliari. The saint was an official in the army of Diocletian, and for his conversion to Christianity was beheaded at Pula. On midday of May 1 the procession leaves and returns on the evening of May 4. It is composed of a cavalcade of horsemen all in the costume of the ancient Sardinian militia, escorting the image of the saint, which is preceded by musicians playing the "launeddas," an instrument made of three or four reeds of different lengths and like the pipe of ancient times.

In the region about Iglesias where the mines are, the workmen celebrate annually the festa of Santa Barbara, "the god of fire," which usually results in much wine drinking, followed by a few days' absence from work, so as to recuperate.

PICTURESQUE COSTUMES OF SARDS

The Sards' costumes are one of their greatest attractions. They are of rich, harmonious, though brilliant, colors, each village having its own distinctive type, which does not change from year to year; so the men and women are thus known by the clothes they wear. Unfortunately the general European type of dress is being adopted by the younger generation, and it is now difficult to find many towns in which the native dress is used by all the inhabitants.

There are a few such villages up in the mountains near Nuoro, where the railroad has not penetrated, and here it is most interesting to see the women and little girls all dressed alike. The skirts are usually very full, accordion plaited in some villages, with a distinctive trimming; white waists with full sleeves, and over these short jackets, open in front or laced around the waist. All in a town have the same combination of color, perhaps a dark red skirt and the jacket in bright red and bright blue, a diagonal stripe of each



NURAGHE, TO THE NORTH OF MACOMER, SARDINIA

Numerous prehistoric monuments like this relic of the Bronze Age dot Sardinia. The arrangements of the interior of these structures are such as to indicate that they were used as fortified habitations and not as tombs or temples. The diameters of these truncated cones range from 30 to 100 feet at the base, and they are from 30 to 60 feet high. The entrances, about 6 feet high and 2 feet wide, almost invariably face south.



Photograph by C. W. Wright

"GIOCARE ALLA MORRA!"

The game of "morra" holds for the man of Italian blood the same allurements that poker holds for some Americans, and that "craps" has for the southern darky. So excited do the morra players become over the hazards of this, their national betting pastime, that tragedies not infrequently result; hence the police frown upon the practice, but always with a certain fond indulgence. It is played entirely with the fingers and consists of trying to guess how many fingers your opponent will hold out at the instant he acts. It is more difficult than it sounds.

color meeting in the back, and with tiny bonnets of the two bright colors. In some the most distinctive characteristic is the covering of the head—a bright-colored handkerchief or a white veil folded back or held in place by a silver chain under the chin; in other towns the apron is characteristic in its color and shape.

The most elaborate dresses are, of course, kept for festas, and these have hand embroidery and are often of very

heavy silks and brocades, sometimes with exquisite lace scarfs or veils folded back on the head. The jewelry is most elaborate, too—large gold buttons worn at the throat; large ear-rings and pendants. The costumes and jewelry are almost always heirlooms in the families.

The men's costumes usually consist of woolen leggings, white, full trousers, long or short, a full ruffle of black cloth worn around the waist; and this, too, differs in length. Some of the jackets are short and some long, but all have silver buttons down the front. The shepherd wears a sheepskin, on which the wool has been left, over his shoulders throughout the year, even in midsummer, and claims that it keeps away the malaria. In some districts the men wear a pointed cap resembling a Phrygian bonnet, long and narrow like a stocking, reaching almost to the waist; the point is either worn down over the shoulders or folded on the top of the head and may be used as a pillow at night. It is apt to contain anything from bread to snuff, which is indispensable to the older Sard. A queer custom of some of the younger men is to let the hair on the top of their heads grow often to 15 inches in length, and then roll it up into a puff, which looks like a pompadour, across the forehead.

Among the distinctive products of Sardinia is cheese made of goat's milk and used very generally by Italians. The wines are noted for their strength. An interesting export is cork, which is taken from the trees every five years, leaving the bare, red trunks noticeable all over the island. Many sheep, goats, pigs, cattle, and horses are raised and sold on the continent.

IMPORTANT MINING OPERATIONS

The mining industry is probably the most important, the principal metals produced being lead and zinc. Iglesias, in the southwestern corner, is the center of mining activity. The mines employ about 15,000 workmen, and the output is approximately 60,000 tons of lead concentrates and 120,000 tons of zinc concentrates annually. Some silver, iron, antimony, copper, and coal are also produced.

The tunny fisheries off the island of San Pietro are noteworthy. In the spring schools of these fish pass through the Mediterranean, and enormous numbers are caught in nets and brought to the large canneries at Carloforte.

There is very good hunting on the island. The moufflon, a cross between a wild sheep and a deer, is found in the mountains and is native only to Sardinia; there are also some fallow deer and red deer. By far the most numerous of the big game is the wild boar. Hare, partridges, woodcock, snipe, quail, and wild duck are all found in large quantities.

AN ISLAND OF WILD FLOWERS

The wild flowers are most beautiful, and there is practically no month in which a great variety is not found. Among these are orchids, narcissus, lilies, gladiolas, irises, cyclamen, fox-gloves, poppies, and sweet peas. In the summer months, usually from May until September, there is no rainfall. During the winter the rains are heavy and often accompanied by strong winds. In the northern part of the island a good deal of snow falls, and often the ground remains covered for a month at a time; but in the southern part of the island there is almost never any snow and seldom any frost. In the gardens there roses, heliotrope, calla lilies, nasturtiums, ivy, geraniums, marguerites, and many other flowers bloom all winter. It is during the summer that these cease blossoming.

May, June, and October are the months most pleasant for travel in Sardinia. The country is at its best then; the cultivated fields green, the wild flowers most profuse, the climate least variable, and the roads, which are covered with "ghiaia," or broken rock, from December to February, are then in perfect condition.

THE AWAKENING OF ARGENTINA AND CHILE

Progress in the Lands That Lie Below Capricorn

By Bailey Willis

WE NORTH AMERICANS, who live in a vast continent that lies nearly all in the temperate and cooler zones, scarcely realize that South America is four-fifths tropical. Fields of wheat and oats are familiar to us, but in South America are scarcely seen outside of Argentina and Chile, except in high, cool valleys. South America might be called a banana country.

Bananas grow from Paraguay to Mexico; wheat and oats flourish only in the tapering tip of the southern continent; and this gives to Argentina and Chile a peculiar interest among South American countries as the homes of vigorous, energetic peoples competent to rule themselves. To Argentina and Chile we may add Uruguay and the highlands of southeastern Brazil, and also the limited areas of the tropical Andes, whose altitude gives them cool climates. The rest of the continent, the vast interior, is the land of the siesta—the land to be developed and administered by peoples of the temperate zones.

The great task and obligation of Argentina, southern Brazil, and Chile, the A, B, C powers, is to guide the development of the tropical Americas, through the exercise of wise statesmanship, toward stability, peace, and prosperity.

Rio de Janeiro, on the Atlantic coast, and Antofagasta, on the Pacific, mark the southern limit of the tropics, and thence southward the southern continent narrows rapidly to the point of Cape Horn. The equivalent distance in North America is from Florida to Labrador, or from oranges to reindeer moss. Florida and Rio are both renowned for their oranges, and Cape Horn shares with Labrador a most inhospitable reputation; but it is more like Scotland than Labrador.

THE SCOTLAND OF SOUTH AMERICA

The southernmost land, tapering southward between the oceans, is nowhere so cold as the broad expanse of North America is in similar latitude, and Tierra del Fuego, a region of bogs, fogs, and snow squalls, is a congenial home for Scotchmen and long-wooled sheep.

Buenos Aires, the focal point of life and intercourse south of Rio, lies half way between Rio and Cape Horn, in the latitude corresponding to Charleston. Palms grow there in the public gardens, and yet, the houses being unheated, a northerner may greatly enjoy on a damp, chill winter day the soft coal fire which he will find where Englishmen congregate.

Neither very cold nor very hot, the seasons are similar to those of our coast from Norfolk to Charleston; but they are reversed. As the sun circles northward past the Equator their summer ends, while our winter half year begins. There is always summer, north or south; always winter, too. When we are preparing to leave the cities Argentine society is gathered from the country estates for pleasure and politics in the greater metropolis, which alternates with Paris and vies with the French capital in seasons of gaiety.

THE METROPOLIS OF THE SOUTHERN HEMISPHERE

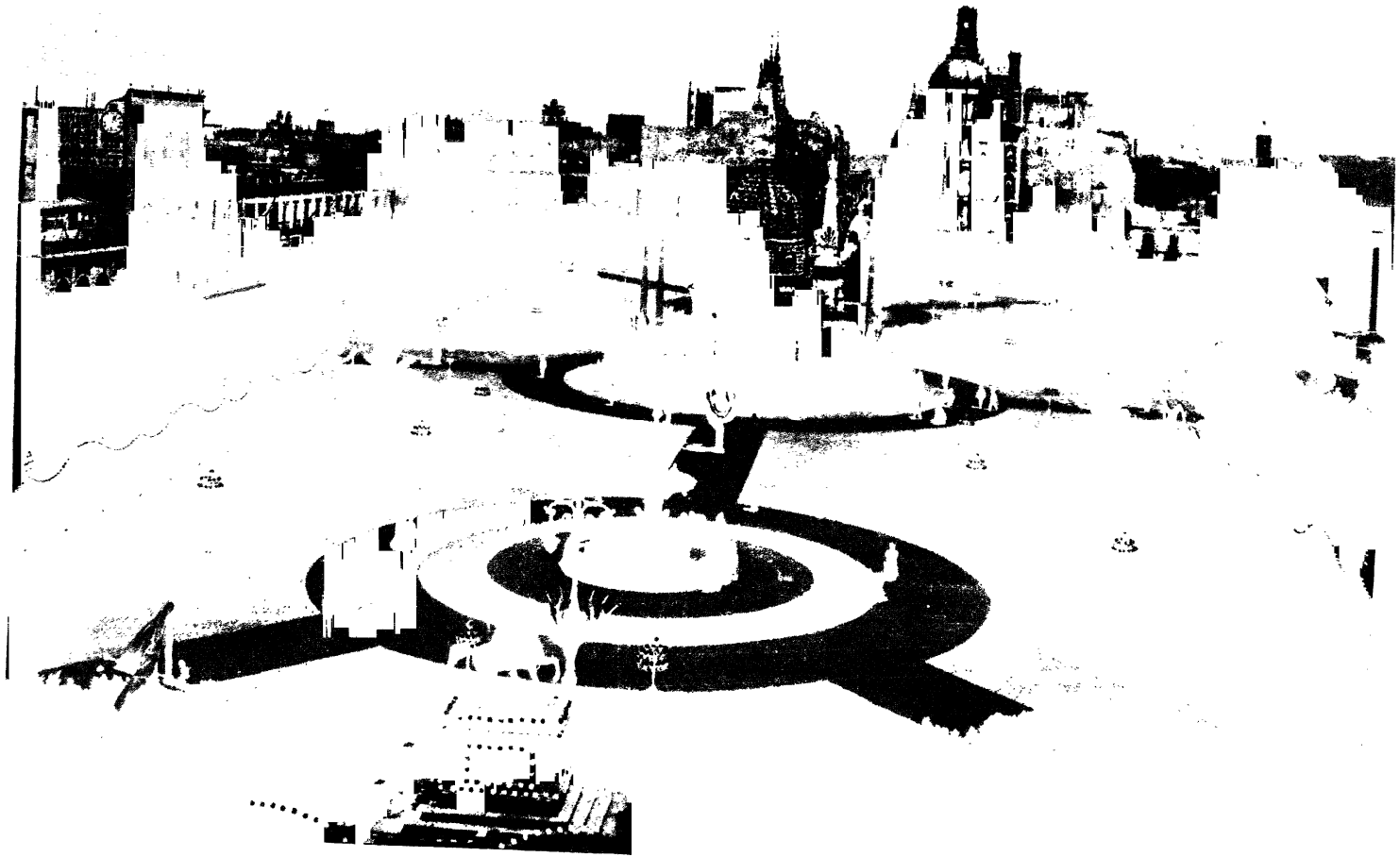
Buenos Aires is to Argentina what Paris is to France—the center of the national industries, thought, and culture. Commerce, journalism, politics, the drama and music, literature, art, and social life are intensely focused there. The brilliant activity of the greatest city of the Southern Hemisphere (the fourth city of the Americas, after New York, Chicago, and Philadelphia) draws the Argentines to it as a flame attracts moths, and one-fifth of the population of the country struggles there in feverish competition for pleasure and gain.

No traveler to the southern countries but stops as long as he may in Buenos Aires to enjoy or to study the most cosmopolitan, yet most latinized, of the



A COWBOY CONCERT IN ARGENTINA

On the thousand and one big estates of the pampas of Argentina the cowboys live much of the time in houses on wheels. They sleep inside and find shelter from cold and rain there, but they cook and eat and rest in the open whenever weather conditions permit.

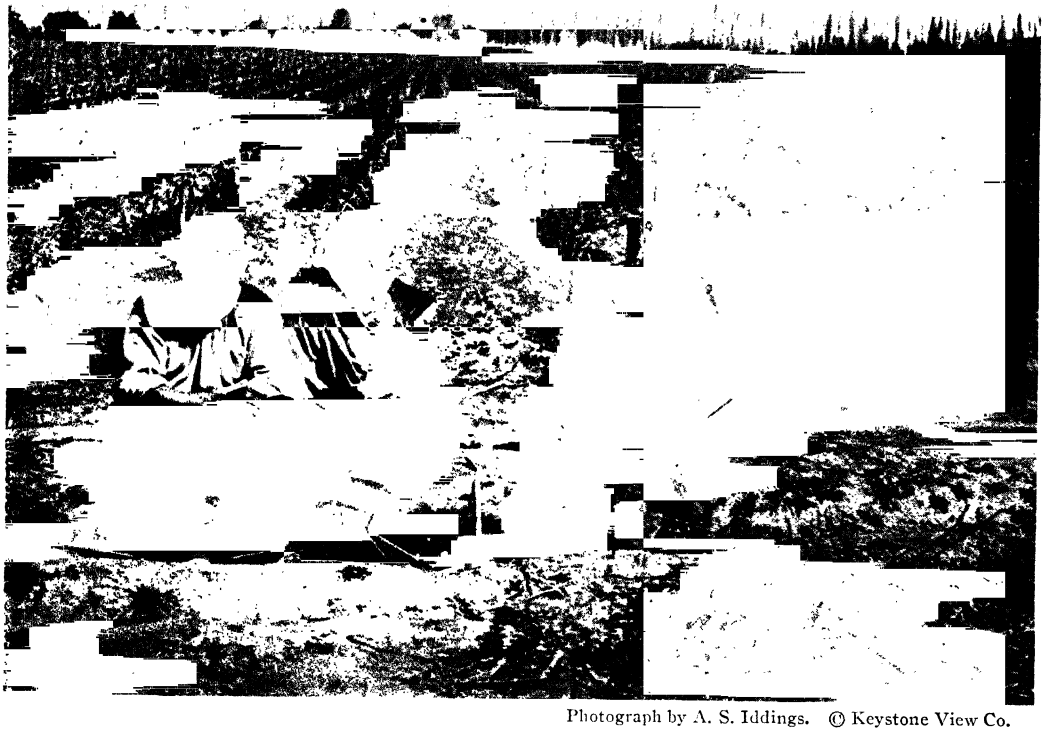


PLAZA DE MAYO: BUENOS AIRES, ARGENTINA

Buenos Aires is the most populous and the richest city in the southern half of the globe. Fifty years ago the Argentine was what Illinois and Iowa and Kansas were a hundred years ago—it had millions of undeveloped acres of the best black soil the earth has to offer. But they were scores and even hundreds of miles from a railroad. Then came the railroads, opening up the country and making a thousand millionaires almost over night.



AN ARAUCANIAN CHIEF (CACIQUE) AND SOME OF HIS WIVES: CHILE



Photograph by A. S. Iddings. © Keystone View Co.

AN ITALIAN SETTLER AND HIS FAMILY: MENDOZA, ARGENTINA

Mendoza is the southern California of Argentina. Irrigation has long been successfully applied to its vineyards, which produce more wine than the combined vineyards of the entire United States of North America. The whole of the province lies at an altitude of more than 2,000 feet. Italians are, for the most part, employed in the cultivation of the grapes, the whole family accompanying husband and father to the field and assisting in tending the vines. The babies are put to sleep in improvised tents while their elders work.

Spanish-American cities. We shall have occasion to return to the metropolis that is at once the heart and the brain of the country, but first let us look at the land itself, of which the port is the gateway.

The location of Buenos Aires combines the advantages of those of New York and of New Orleans in all that relates to oversea and to inland commerce. Transoceanic routes converge to the Rio de la Plata as they do to the Hudson; the navigable waterways of the Paraná-Paraguay reach as far into the interior as the Mississippi-Missouri and offer deeper channels to navigation. As far as Argentine jurisdiction extends, the Uruguay, Paraná, and Paraguay rivers have been dredged and buoyed and already are prepared to serve as arteries of commerce, such as the Mississippi is yet to become.

North of the Rio de la Plata and between the Atlantic and the Paraná-Paraguay basin stretches the most beautiful and healthful region of semi-tropical South America. Here are the coffee plantations of Saõ Paulo, Brazil, the most productive of the world; here the German settlements of Santa Caterina and Rio Grande do Sul constitute the isolated Teutonic colonies; here Uruguay and Paraguay form buffer States between the great rivals, their neighbors, and here are included the rich Argentine Commonwealths of Entre Rios and Corrientes.



A WELL-TO-DO FARMER AND SOME OF HIS VAQUEROS

A LAND OF VAST POSSIBILITIES

Equivalent in area to the region which stretches northwest from the Alleghanies to the Mississippi and the Great Lakes, equal to the States of Alabama, Mississippi, Tennessee, Kentucky, Ohio, Indiana, and Illinois in extent, beautiful in upland landscape of verdant hills and valleys, this territory invites a dense population whose prosperity would be assured under a good government.

But divided as it is by arbitrary political boundaries, misgoverned with various degrees of misgovernment, it lies inert. The failure of individual and governmental initiative, the isolation of the frontier, where weak settlements face the forest, the lack of roads and railroads leave the interior still a part of the wilderness.

Santos in the north and Montevideo in the south are the outlets of this rich country. Both are important shipping ports, from which railways radiate westward and northwestward. Eventually they will be connected with one another and with Asunción, on the Paraguay, by lines that will develop and will exploit its resources.

Montevideo holds a position naturally superior to that of Buenos Aires, and were it the capital of an equally great republic might rival the latter in wealth and population; but, limited as Uruguay is by the Argentine and Brazilian possessions to the proportions of a petty State, it constitutes the hinterland of a secondary city, which Montevideo will long and perhaps always continue to be.

The Rio de la Plata separates two widely different districts—the wooded uplands of Uruguay and the treeless pampas of Argentina. The former is the southern extension of the great region of Brazil, and although now largely brought into cultivation, it is a region where trees flourish as a part of the indigenous flora. The pampas, on the other hand, have always been treeless until plantations of eucalyptus or orchards of fruit trees were laid out upon the estates of wealthy Argentines.

PAMPAS COMPARED WITH PRAIRIES

The pampas are a vast grassy plain. Is there anything more to be said? As an Englishman put it, "What can you say about a bally billiard table except that it is a bally billiard table?" Yet the plain of the pampas is not like the great western plains of the United States. The latter are broken by gullies, furrowed by streams, traversed by river valleys. The pampas are not.

Among all landscapes of the world there is none more meadow-like than the flat pampa, with the cattle grazing in the rich grass; but the meadow grass hides no meandering brook. Hour after hour and day after day you may ride without crossing a stream. You will, however, encounter many shallow pools and lakelets.

The pampa looks so flat, so featureless! But is it? Watch a horseman galloping away toward the horizon, toward which he rises silhouetted against the sky. Soon he sinks and drops out of sight, having apparently ridden over the edge of the world; but an hour later he may rise again, topping a more distant swell of the vast grassy ocean surface. North, east, south, or west it is the same—a billowy plain, hollowed and molded by the wind, the free-flowing air, which in place of running water has sculptured the immense expanse of fine brown earth.

THE AMERICAN WINDMILL'S GREAT SERVICE

It is a paradise for cattle in the average year, when the rain fills the lakelets and the pasture, whether freshly green or cured to natural hay, affords abundant feed. Occasionally a dry season intervenes; the water pools dry up; the plain becomes a waterless desert. Formerly in such years disaster overcame the herdman and his herds. Lingering by the shrinking pools, hundreds of thousands of cattle and sheep suffered from thirst and famine till they fell and mummified in the dust. It is somewhat different now.

The seasons still vary inexorably, and from time to time comes one of drought and loss; but it has lost its gravest menace. Scattered over the pampa, wherever they may be wanted, are windmills, and beside each mill is a tank and drinking trough. The wind, which so sculptured



THE ARGENTINE VERSION OF THE AMERICAN PRAIRIE SCHOONER

Here is a woman who owns 180 square miles of prairie land; there an Irishman who landed penniless fifty years ago and now has land valued at $20,000,000. Some of these big land-owners are still many miles away from the railroads. The 8-ox cart takes the place in this antipodal bonanza farming country of the 4-horse team on the American farm.



Photograph by Nevin O. Winter

THRESHING ON THE PAMPAS WITH AN AMERICAN ENGINE AND AN ENGLISH SEPARATOR

The people of Argentina annually raise for export forty dollars' worth of foodstuffs per capita. The highest prices ever paid for breeding stock has been paid by the Argentines, with the result that they have the finest draft horses, the best of beef cattle, and the highest type of sheep. Argentina is becoming one of the world's great granaries.

the hollows of the plain that a very large proportion of the rainfall sinks into it, now pumps the supply back to the herds, which otherwise might perish stamping the dust just above the subterranean waters.

Man meets Nature and conquers her, the more effectually the more intelligently he goes about it. Common sense impels the ranchero to erect windmills, or in seasons of drought to drive his cattle to districts of more abundant rainfall. The Argentine is also raising fodder crops, and as the cattle industry becomes organized on the sound economic basis of the greatest good for the greatest number, instead of the system of "*Sauve qui peut,*" the herds of the pampa will no longer know the famines that in earlier times depopulated the plain.

The soil and the climate of the pampas give the Argentine Republic its high rank among the wheat and corn growing countries of the world. The soil is an ancient alluvium, the fine sediment carried by old rivers far out from the mountains, like the deposit now being made by the Paraguay and its tributaries, an island delta far in the interior of the continent. The sediment was very fine, and mingled with it is a large proportion of fine volcanic dust, blown from the volcanoes of the Andes.

It covers about 200,000 square miles in the provinces of Buenos Aires, Santa Fe, Córdova, and San Luís. Like the renowned loess soils of China, it is exceedingly fertile and, being very porous, absorbs the rain waters, which rise again by evaporation and supply the surface soil constantly with plant food.

WHEAT REGULATED PROSPERITY

In former days it mattered nothing to the world at large and comparatively little to the Argentine himself whether the season was a favorable one for wheat or not; but now, when millions beyond her confines look to Argentina for bread and when Argentine prosperity is regulated by the wheat she sells, it matters much.

The time will come, probably, when plentiful rains or drought will matter less than now; for at present agriculture in



Photograph by Bailey Willis

MIRROR LAKE (LAGO ESPEJO), IN THE ARGENTINE NATIONAL PARK, NORTH OF LAGO (LAKE) NAHUEL HUAPI LAKE REGION OF THE ARGENTINE ANDES, TERRITORY OF RIO NEGRO

The boundary with Chile follows the distant crest, with summits at about 6,500 feet above sea. The altitude of the lake is 2,560 feet—near the line of the transcontinental railway from Puerto San Antonio, Argentina, to Valdivia, Chile.



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THE BAY AND CITY: VALPARAISO, CHILE

The city of Valparaiso, as well as almost the whole of Chile, have been severely tried by earthquake, and the fact that the nation has risen from each such disaster with no apparent interruption to its growth is nothing short of remarkable. The city was almost wholly destroyed on August 16, 1906, by an earthquake and the terrible fires which attended it, sustaining a $100,000,000 property loss. Yet within a single decade few, if any, traces of the disaster may be seen, and the city is larger and more prosperous than ever.

Argentina is in that elementary state when it is most exposed to injury by the vicissitudes of climate. Great fields are cultivated by few hands. The poorly prepared soil, the shallow plowing, the neglect of cultivation, all invite losses in any but a favorable year.

In the east the rainfall is usually abundant or excessive. There are areas of Buenos Aires province which are inundated by heavy rains, and great drainage works have been undertaken by the government at the instance of the landowners. From east to west the rainfall diminishes till it becomes insufficient for agriculture in the average year, and farming can prosper only where irrigation is practicable.

SOILS SUITED TO EVERY CROP

Thus the pampas, of which we may think as a monotonous region, exhibit



Photograph by Bailey Willis

VALLEY OF PILEANYEU: RIO NEGRO (BLACK RIVER), ARGENTINA

Resurrected peaks in the treeless pampas of Rio Negro, 50 miles east of the Andes. These rocks represent an old mountain ridge which was completely buried under volcanic ash and has been exposed again by erosion. The valley is characteristic of the grazing country at 3,000 to 4,000 feet above sea.

great diversity of aspect. Proportions of them may be flooded while other distant regions of the same plain are drying up. Portions are suited to the growing of wheat, others to cattle raising, and still others in the warmer, rainy zone about Rosario are adapted best to the raising of Indian corn.

The Great Southern Railway of Buenos Aires compiles for its own information charts which show the quantities of wheat, oats, linseed, cattle, sheep, and alfalfa received at each of its stations year by year. Thus the management may know not only what income any station yields, but also what is the crop that produces the particular return. It is most interesting to observe the grouping of products—wheat in this district, oats in another, cattle elsewhere—each in its preferred localities predominating over minor quantities of the other products and demonstrating the existence of controlling factors which give great economic diversity to the apparent natural monotony of the pampas.

In part due to natural conditions, in part dependent upon artificial ones, such as the lack of roads, these factors are changing from year to year; and they are destined to change constantly in the direction of greater security and productiveness in agricultural pursuits as the country passes from the actual primitive conditions of development to those of a more advanced community.

THE HUB OF THE ARGENTINE WHEEL OF FORTUNE

To gain an idea of the extent of the fertile pampa region, one needs but look at a railway map of Argentina. Buenos Aires and Rosario are the two ports of shipment of its products, the centers from which traffic radiates to all sections of the country. English and other capital has been expended to the amount of 200,000,000 pounds sterling in building railways to develop the rich lands, but in the more arid and less profitable country the lines have been extended only as trunk lines, aimed to reach some distant point. The pampas are the hub of the Argentine wheel of fortune, of which Buenos Aires, the Argentine El Dorado, is the center.

The area of the pampas, about 200,000 square miles, is one-sixth of the country. In the larger part which lies beyond the pampas, the other five-sixths, there is a great extent of lands destined by the general scarcity of water to pastoral pursuits; there are some real desert areas; and there are also districts of great natural resources, which are either actual or potential contributors to the natural wealth.

THE ROME OF THE ANTIPODES

In the Argentine all travel, all enterprise, all development, stars from Buenos Aires. Let us place ourselves in that Rome of the Southern Hemisphere, from which all roads lead, and make rapid excursions to the more interesting of the outlying provinces of her commercial dominion.

An excursion to the northward may pass by rail through the provinces or States of Entre Rios and Corrientes to the Territory of Missiones, which was secured by Argentina through the arbitration of her boundary with Brazil by President Cleveland. Entre Rios and Corrientes are lands traversed by ancient watercourses of the Paraná, which form wide expanses of swamp among the moderately high ridges and plateaus.

Missiones, an extension of the western table-land of Brazil, is a paradise, like upland Florida, scarcely ever touched by frost. This is the route to Paraguay and the old city of Asunción, from which the traveler will prefer to return by one of the steamers plying down the river of Buenos Aires or Montevideo; or, if it be one of the Brazilian Lloyd line, even making the voyage to Rio.

The line of the Central Córdova Railway, after leaving the Paraná and Rosario, runs through Córdova, the conservative seat of Spanish aristocracy and learning, and on through the desert of Santiago de Estero to Tucumán, the oasis where the sugar monopoly flourishes. Tucumán lies in a local area of greater rainfall at the foot of the superb Aconquija Range, a spur of the Andes which towers more than 10,000 feet above the city.

Where the streams from the mountains spread upon the tropical plain, there



Photograph by Bailey Willis

LAKE NAHUEL HUAPI: ARGENTINE ANDES

View from the outlet of the lake, where the Rio Limay (Limay River) leaves it, toward the Andes. The lake is 60 miles long, winding to the right behind the promontory and penetrating to the heart of the Andes. The new transcontinental railway between Puerto San Antonia, Argentina, and Valdivia, Chile, will cross the Limay at this point and skirt the lake opposite the range. Mount Tronador, the highest visible peak has an altitude of 11,400 feet.

are extensive plantations and refineries; and on the mountain slopes are the villas of the wealthy planters, who may be whirled in a few moments in their autos over well-built roads to temperate or even to alpine climes. Extending still farther northwest, the railway reaches Quiaca, on the Argentine boundary, where it is eventually to be connected with the Bolivian system that centers in La Paz. Those who do not mind two or three days' staging may even now go on via La Pas to Antofagasta or Mollendo, on the Pacific coast.

Córdova, the old university town, was linked in the old colonial days by such lines of commercial intercourse as existed and by ties of interest rather with Tucumán, San Juan, and Mendoza, the centers of population in the Andes, than with the isolated settlement of Buenos Aires on the coast; and in sympathy at least the relation still holds. Provincial conservatism is characteristic of the interior cities. In Mendoza, however, wealth has done more to modify the old customs than in Córdova.

THE SOUTHERN CALIFORNIA OF SOUTH AMERICA

Mendoza is the southern California of Argentina. Irrigation has long been successfully applied to her vineyards and she has grown rich on their products. She lies also on the historic route across the Andes by which San Martín entered Chile with the army that liberated that country from the Spanish dominion. The railway now ascends by the valley of the Mendoza River over the barren wastes of the high Andes, which are here cursed by both drought and cold; and, passing through the summit at 10,600 feet, descends rapidly to the valley of the Aconcagua River and the fertile plains of central Chile.

In our excursions thus far we have traveled among the centers of the old Spanish settlements founded 300 years ago. Now let us turn to the south and southwest, to the country where the Indians were dominant till within 30 years, where explorers now living have been held captive by them, or have been able to traverse the plateaus and mountains only as companions of the roving Indian bands.

Bahia Blanca is today a city of 70,000 inhabitants, with extensive wharves, huge wheat elevators, and various lines of railways converging to it. Yet as late as 1879 it was an outpost which was repeatedly isolated from Buenos Aires by powerful Indian raids. Now the intervening pampa is all converted to private property and divided by wire fences.

A POOR PROSPECT BECOMES A RICH INVESTMENT

When, in 1902, war over the question of the boundary in the Andes seemed imminent between Argentina and Chile, it was felt that easy communication must be established between Buenos Aires and western Patagonia, where the disputed boundary lay, and the government gave the Great Southern Railway of Buenos Aires a very liberal concession to build a branch from Bahia Blanca westward up the valley of the Rio Negro as a strategic element of defense.

The company undertook it unwillingly, for the country was considered a desert; but the road has paid interest on its cost almost from the first year after its construction, and, being now extended beyond the valley of the Rio Negro to a low pass in the Andes, it will ultimately form a transcontinental route which will connect Bahia Blanca with Concepción.

In the valley of the Rio Negro is a region which, through the utilization of the waters of that great river for irrigation, is being converted into one of the garden spots of the Republic. The climate, which in temperature resembles that of our south Atlantic coast, the fertile soil, and the abundance of water, which will eventually be brought under control, so as to minimize the effects of floods and the scarcity of the dry seasons, all combine to give this district a rich promise. At present it is still in the initial stages of development, lacking adequate organization of its industries and society and needing competitive development of means of communication with its markets.

In this excursion to the valley of the Rio Negro we reach the southern limit of the connected Argentine railway sys-



VIEW OF SANTIAGO, CHILE, WITH THE ANDES IN THE BACKGROUND

"Santiago is the chief city of Chile, but not in the same degree as Buenos Aires is of Argentina. It contrasts with Buenos Aires as the conservative capital of a small country with the metropolis of the continent. You feel in the Chilian capital the conservative character of the people; in Buenos Aires the liberal spirit of the world city" (see text, page 130).

tem. We are on the northern borders of Patagonia, the synonym for remoteness and isolation. Yet within its confines are to be found immense sheep ranches, managed not only by Argentines; but the largest and best of them by Scotchmen and Australians, who direct the investment of English capital. National railways have been extended at government cost from several ports of the Atlantic coast into the interior, and when the wave of prosperity once more returns to Argentina, as following the present depression it soon will, Patagonia will invite still larger investments of capital and take rank among the growing territories of the Republic.

A HIDDEN SWITZERLAND

One is constantly surprised at the magnitude of the far southern country. Hidden in the Andes of Patagonia and occupying but a small part of their great length is a country as large as Switzerland—a region of beautiful lakes, forests, and snow-covered peaks.

We have now spoken of southern Brazil and of Argentina. There remains of the temperate lands of South America only Chile, that longest and narrowest of all the countries of the world. Having a greater extent from north to south even than Argentina, it stretches 2,700 miles, from Cape Horn to the deserts of Atacama, within the tropics. Its width is rarely more than 125 miles from the ocean to the Andean crest. If we were to place it upon a similar stretch of coast in North America, it would cover Lower California, California, Oregon, Washington, and British Columbia to the St. Elias district of Alaska.

Chile is divided into three sections by the natural features of the Pacific slope of the Andes. The northern is that of the semi-arid and desert region, which reaches from Peru southward to Valparaiso. It is an utter desert in the north and becomes less inhospitable toward the south. It is traversed from the Andes to the coast by short, deep valleys, separated by high spurs of the mountains, and communication from north to south has always been exceedingly difficult. Nevertheless, the Chilean engineers have found a route by which to extend the State railway which shall link Santiago with the territories conquered from Peru.

THE HEART OF CHILE

The central section extends through 9 degrees of latitude for a distance of about 600 miles from Valparaiso to the island of Chiloé, south of Puerto Montt. This is the heart of Chile, the only portion of the country which can support a sufficient population to constitute a nation. The area is not large, about 100,000 square miles, and much of it is occupied by mountain ranges of great height and ruggedness.

But between the Andes and the coast range there extends in this section a valley similar to that of California, which is the seat of the Chilean people. Many rivers rising in the Andes descend to it and meander more or less directly westward through the coast range of the Pacific; but the intervening divides are nowhere of such altitude as to interrupt the continuity of the great valley that extends from north to south. Santiago is situated at its northern end, and flourishing cities are located at each favorable point on the railway that connects the capital with Puerto Montt.

The climate as we go from north to south becomes ever more humid, and we pass from the irrigated lands about Santiago to the dense forest swamps of the southern portion of the district. While much of the land has been cleared or is in the process of clearing, in a state which reminds one of our own Pacific coast 30 years ago, other areas remain impenetrable forests, still unexplored after nearly 400 years of occupation of the country.

The third section of Chile, extending southward from Puerto Montt through 14 degrees of latitude to Cape Horn, is like our southern Alaskan coast — a stretch of islands and peninsulas broken by intricate channels and profound fiords that penetrate far into the land. Tumultuous rivers descend from the Andes and debouch into the fiords in swampy deltas which are covered with dense forests.



Photograph by Bailey Willis

THE PASS OF THE BLACK BOX OR CAJÓN NEGRO: ANDES

The Bahia Blanca-Concepcion transcontinental railway will be located high above the lake (Lake Villarino) and will pierce the range below the pass in a tunnel a mile long, at 3,800 feet above sea

The large island of Chiloé, which was conquered by Valdivia before the middle of the sixteenth century, is well populated and occupies a position with reference to the more frequented northern coast similar to that which Vancouver Island holds to San Francisco. Farther south the population becomes very scanty, glaciers descended from the Andean heights, and the savage but majestic scenery of Smythe Channel and the Straits of Magellan suggest that of the inland passage and Lynn Canal of the Alaskan coast.

SANTIAGO AND BUENOS AIRES

Santiago is the chief city of Chile, but not in the same degree as Buenos Aires is of the Argentine Republic. Buenos Aires has become almost the Republic itself, in the sense that Paris is France; but Santiago is but the capital of the country, which has other cities that may compare with it in local importance. Santiago contrasts with Buenos Aires as the conservative capital of a small country with the metropolis of the continent. You feel in the Chilean capital the conservative character of the people; in Buenos Aires the liberal spirit of the world city.

The people who are developing the lands of South America, and in that development are themselves evolving special characters and new racial types, are those whom we loosely call Latin-Americans. Their language is of the family of the Latin tongues, and that fact fixes in the public mind the relationship of the people among European nations; but that is a very superficial estimate. If we call them Spanish-Americans and we consider what the Spaniards' origin is, we shall come nearer knowing our neighbors.

THE SPANIARD AN IRISHMAN FIRST

The ancient Spaniard was a Celt before he was conquered by Rome, and as a Celt he is represented today by the still distinct group of the Basques. The greater part of the Celtic tribes were less resistant. Five hundred years of Roman government and two hundred of domination by the Visigoths, followed by eight centuries of Moorish influence, consciously and unconsciously wrought changes in the people, evolving the special Spanish type.

All of the races which entered into that type were more or less numerous and influential in the development of the other people of Europe, except one. The Moors constitute an element of the Spanish blood which produced traits that are peculiar to the Spaniard among European peoples. In studying America we should not forget that the Moors maintained their civilization in Spain up to the date of the discovery of America and influenced the character of the Spanish conquerors. They represented that Arabic civilization which maintained learning and science during the dark ages of Europe, and their daring courage, their impetuosity, and their individualistic spirit have been transmitted to their remotest descendants.

A MANY SIDED DESCENT

A further fact relating to the origin of the Spanish-Americans, and one frequently cited by their own writers, is the mixing of the invaders and the aborigines in the colonial populations. Their writers tell us that the Indians who died under the tyranny of the Spanish masters bequeathed to those masters half-breed sons and daughters to perpetuate the race. The mestizo, or half-breed, became a universal and numerous element; the criollo, or American-born child of European parents, the local and less common factor in the colonial population.

Thus there sprang into existence the Spanish-American race, child of the Celt, the Roman, the Goth, the Moor, and the American Indian. His Spanish fathers were themselves variously characterized: the austere Basque, the arrogant Castilian, the impetuous Estremaduran, the facile and graceful Andalusian. And the Indian mothers were as unlike: the gentle Aztecs of Peru, the fierce Guarani of Paraguay, the sanguinary Puelche of the Pampas, the indomitable and independent Araucanian of Chile.

Inheritance tells. The Spanish-Indian mestizo exhibits the diversity of his ancestry. To inheritance has been added the effect of local environment and isola-



Photograph by Bailey Willis

FOREST OF BEECH AND BAMBOO IN THE ARGENTINE ANDES

Argentina does not possess the timber resources of its neighbor, Brazil, there are many thousands of square miles of forest lands still untouched

tion. A profoundly interesting field of research in human variation awaits the student of the race in evolution.

In touching on this vast example of human evolution involving today 60,000,000 of people, we can glance only at some of the incidents related to the Argentine and Chilean nations. Both populations were well established before the close of the sixteenth century, but by very unlike elements. Valdivia and his successors, the invaders of Chile, were soldiers bent solely on conquest, such as they had taken part in in Peru, for immediate gain; the colonists who in successive expeditions founded Buenos Aires came with wives and children, with horses, mares, and implements of husbandry, to settle in the land.

THE SPIRITED PRODUCT OF A RACIAL AMALGAMATION

The warring invaders of Chile met and mingled with a warlike Indian race, the Araucanians, and their issue is without question the most independent, the boldest, the most aggressive of South American peoples.

The merchant colonists who sought the Rio de la Plata maintained to a greater degree the purity of the European blood and have constantly been reinforced by fresh immigrations from all the nations of western Europe. They are today the most enterprising, as they are the most cosmopolitan and progressive, of the Spanish-Americans.

During the first century of its existence the colony of Buenos Aires was the victim of that monopolistic policy so characteristic of the individualistic Spanish tendencies. Although destined by geographic situation and accessibility from both land and sea to be the commercial focus of the continent, the settlement was denied commercial intercourse.

During half a century the shipment of cargoes to or from Buenos Aires was absolutely prohibited under penalty of death, and during the following 50 years traffic through the port was so restricted and burdened as to amount to prohibition. Lima was the center of government and monopoly. All the produce of the continent destined to Spain was gathered there and shipped via the Isthmus of Panama. Only articles of small bulk and high value could pay the freight charges and the imposts. The heavy freight of hides, wheat, or wool could not move by that channel; and the pampas of Buenos Aires, producing nothing more valuable, shipped nothing.

No more colossal example of misgovernment, no more striking illustration of the incapacity of medieval Spain to govern the colonies her soldiers had won, is to be found even in her annals.

STATE'S RIGHTS IN THE ANTIPODES

The northern cities—Córdova, Tucumán, Mendoza, and San Juan—were established by leaders from Lima and remained attached to that transmontane capital, through which their commerce flowed. They did not sympathize with Buenos Aires in her isolation; and, later, when independence from Spain had been won, when the Argentine Republic was struggling into existence, the civil wars were fought between the conservatives of the interior and the progressives of the coast. Something of the same division exists today. Córdova and Mendoza are intensely provincial; they are for States' rights. Buenos Aires, grown immensely powerful and the seat of national government, emphasizes national control.

The isolation of Buenos Aires and the pampas influenced the evolution of the Argentine people of the country outside of the cities in a striking degree. It helped to develop the Gaucho, the Argentine plainsman, whose natural evolution in adaptation to the environment of the pampas was intensified and accentuated by separation from the ameliorating effects of intercourse and culture.

The Gaucho sprang from the Spaniard and Indian. He was a nomad. His life of frugality, activity, and hazard favored the fittest and fiercest. He knew no law save that of might. He was independent, daring, familiar with violence, and careless of life. Had he through a Spanish parent some Moorish strain, he represented in the pampas his ancestors, who had galloped over the plains of Arabia. Sarmiento describes in graphic language the wild barbaric character and life of

the Gaucho and finds a likeness to Arabs he himself had known.

THE CARRANZAS AND VILLAS OF A BYGONE GENERATION

In the wars of independence, 1810-1816, the Gaucho played an important part under General San Martín and General Belgrano; in the civil wars that followed he fought under captains of more or less authority, such as Carranza, Villa, and Orozco are today; and in the tyrant Rosas, 1830-1852, he became the dictator over the lives and fortunes of the higher classes of society.

It would be of interest in a study of Rosas to compare and contrast him with Diaz of Mexico, Guzman Blanco of Venezuela, Francia and Lopez of Paraguay, and many others of his kind, who represent the natural product of anarchy, the tyrannical "caudillo," or chief; but in Argentine and Chilean history the tyrant belongs to a vanished past.

Under the presidents who have succeeded, from Mitre, in 1862, to Saenz Pena, in 1910, the government of the Republic has been held by those who felt themselves entitled to rule by virtue of their education, intelligence, and ability.

WHEN REPUBLICAN GOVERNMENT WILL DAWN

Saenz Pena took the patriotic stand that he was president of the nation, not of a party only; he carried sound election laws and enforced them, with the result that the administration was antagonized, the congressional majority was disorganized, and the law-making body was paralyzed by party strife, which is not yet ended. Meanwhile the radical and socialist vote grows with each election, and may become a serious menace in a country where there is no considerable middle class of conservative property owners—citizens between the wealthy land-owners and the peons.

Immigration and the occupation of lands by the small farmer proprietor are means working toward the establishment of the middle class, without which so-called republican government in Argentina or elsewhere must always remain a figment of reality. The government wisely seeks to promote immigration, and there are laws designed to favor the increase of small holdings, the principal one being the inheritance law, which tends toward the division of large estates.

But immigration is not large. It is offset by emigration, amounting, in 1911, 1912, and 1913, to about 50 per cent of the immigrants. And the net annual result is an increase of only about 2 per cent in the population. Considering the great extent of territory, the small population, and the wealth of the nation, this is not a favorable showing. Spanish and Italian immigrants form about 80 per cent of the total, and entering, as many of them do, merely as laborers for the harvest season, they form an even larger proportion of the emigrants.

The attachment of these peasants to their homes in Spain and Italy is one reason for their return migration; but there is a deeper cause for emigration and for the small net increase in population by immigration. There is no room in Argentina, except in remote territories, for the man with small capital unless he is willing to remain a laborer. Liberal immigration laws do not help him. His way to independence as a farmer is barred by the great landed proprietors.

In Argentina, as in all other Spanish-American countries, the prevalence of great estates, the condition of the "latifundia," the old Roman curse, is the greatest obstacle to citizenship and good government. To pursue this topic would lead us too far afield; but it is pertinent to the contrasting of North and South America to remind ourselves that the Republic is founded in that body of intelligent and independent citizens who own their homes. They alone govern steadily.

WARDS OF THE UNITED STATES

Notes on What Our Country is Doing for Santo Domingo, Nicaragua, and Haiti

THE island of Haiti, upon which are located the Black Republic of Haiti and the Mulatto Republic of Santo Domingo, is the scene today of two of the most interesting experiments in government that may be found anywhere in the world.

After a century of effort to maintain itself as a separate, independent, sovereign nation, Santo Domingo in 1905 found itself about to fall victim to its own excesses. Revolution had followed revolution almost with clocklike regularity. There were assassinations, there were betrayals, there were conspiracies, there were wars within and wars without—war with Haiti over boundary questions and civil war over the control of the government. Debts were piled up without thought of the day of payment, or even provisions for meeting interest charges. Those who were in control of the government, whether for a day or for a year, were more concerned about the money that could be abstracted from the national treasury than they were about the preservation of the national credit.

So long and so steady was the orgy of revolution, speculation, debt-making, and interest-dodging that the nation's credit grew worse than that of its individual citizens. Finally the day of reckoning came. Foreign warships approached the ports whose harbors had given refuge to the great discoverer Columbus, and whose capital city still contains what undoubtedly are his ashes, and demanded that the claims of their subjects be satisfied—claims for money advanced, claims for interest accumulated, claims for property wantonly destroyed—and they demanded it at the point of big naval guns.

Ordinarily the Dominicans, like most of the other peoples of tropical America, dislike the Monroe Doctrine and view it as a reflection upon their strength. They think they are big enough to take care of themselves and look upon that international policy as one tending to interfere with their sovereignty.

ANY PORT IN A STORM

When Santo Domingo's treasury was empty, however, its borrowing capacity at zero, and Europe at its door threatening to take over its administration, and thus to collect its debts, no harbor ever looked more like a haven of refuge to a storm-tossed mariner than the Monroe Doctrine did to the Dominicans. In a hole from which they were powerless to extricate themselves, they were ready enough to negotiate a treaty turning over the control of the country's customs to the United States if, in return therefor, the United States would protect them from angry European creditors and rejuvenate their treasury.

And so it was that in 1905 the United States undertook to serve as treasurer of Santo Domingo and to vouch for her debts. Under the modus vivendi first, and then under the treaty, it was agreed by Santo Domingo that the United States should take over her customs-houses, put them under an American Receiver of Customs, and distribute the collections in certain proportions among the several necessities of the country. First, the cost of the receivership should be met, not to exceed 5 per cent of the collections; then $100,000 was to be paid monthly into the interest and sinking funds for the amortization of the loan which had been made under the guarantee of the United States; the remainder was to go to the Dominican Government, with the exception that when the revenues exceeded $3,000,000 a year one-half of the excess should go to the sinking fund.

There was a provision in the agreement giving the United States some control over the power of revenue legislation. It was to be consulted when changes of the tariff laws were consid-



Photograph by Harriet Chalmers Adams

THE TOMB OF COLUMBUS IN THE CATHEDRAL OF SANTO DOMINGO CITY: SANTO DOMINGO

When the Spaniards undertook to remove the ashes of the great discoverer from Santo Domingo to Havana, they apparently made a mistake and took the casket containing the bones of his son, Diego, instead; for later, when the cathedral was being remodeled, a leaden casket was found, the inscriptions on and in which tend conclusively to show that it contains Christopher Columbus' ashes. The most painstaking care was taken to establish the identity of the casket found, and practically every unbiased investigator agrees with the historian of Columbus, John Boyd Thatcher, that his ashes repose in the Cathedral of Santo Domingo instead of at Sculla, Spain, as the Spaniards believe.



Photograph by Harriet Chalmers Adams

RUINS OF THE DAYS OF COLUMBUS: CAPE ISABELLA, SANTO DOMINGO

These are the ruins of the oldest surviving structure of the white man's permanent occupation of the New World

ered, and the debt could not be increased without our consent.

When the question of a revision of the tariff came up it was urged by the American authorities that the duties should be laid on luxuries rather than upon necessities, upon the things of the rich rather than upon those of the poor. It was the other way around under the old régime. There was a high duty on cotton and a low one on silks, a heavy impost on beer and a light one on champagne. Rice bore a heavy duty and sardines in oil next to none.

A NEW TARIFF POLICY

Under the revision supervised by the United States all this was changed. The tariff, as a whole, was cut down, and necessities were admitted at low rates and luxuries at high ones. The general reduction was 50 per cent on export taxes and 14 per cent on import duties.

And yet, in spite of this great reduction, in spite of payments of $1,200,000 a year on the debt, there was still left a greater net income for the use of the government than it had ever had before.

AN ASTOUNDING PERFORMANCE!

Not only that, but, under the law which entitled him to 5 per cent for the expense of collections, the receiver was able to reduce the costs to such a point that in seven years he turned into the Dominican treasury $200,000. It was astounding to the Dominicans that any one should turn into the treasury the savings of an economical administration.

For a long time it was thought that, deprived of the opportunity of securing customs-house revenues through the seizure of ports, revolutions could not support themselves. But after six or seven years of peace, during which unprecedented strides of progress were made, trouble broke out again, and during 1914 and 1915 it became so serious that the United States was forced to intervene in behalf of peace and to demand, with marines on shore and naval guns trained and pointed on the ports, that the country re-



Photograph by Harriet Chalmers Adams

CARRYING CEROONS OF TOBACCO TO TOWN: SANTO DOMINGO

Santo Domingo is naturally one of the richest countries in the world. Its sugar lands rival those of eastern Cuba, and its tobacco lan... produce a leaf almost as fragrant as does the wonderful soil of Cuba's western provinces.



Photograph by Harriet Chalmers Adams

GATEWAY TO THE CITY OF SANTO DOMINGO

Near the river gate is a sturdy ruin, made up of two square towers joined by a central block. Black and roofless, in spite of the squalor of its surroundings, it still proclaims the time when it was "the magnifical and princelyke house" of Christopher Columbus.

turn to a state of quiet. And so today the Dominicans, realizing that the Monroe Doctrine is determined to afford them protection from their own excesses, their own bitter passions and blind purposes, have accepted the inevitable and have secured the blessings of peace from without when they could not attain that end themselves. It is a reluctant acquiescence they yield, but a wholesome one, none the less.

It has not been without effort or without expense, nor yet without the actual sacrifice of blood and life that our country has stepped in to play the rôle of Good Samaritan to the peoples of Santo Domingo, Haiti, and Nicaragua, who had lost the blessings of peace and were unable to regain them. In Haiti alone we lost one officer and six marines and had a number wounded. How much in money it has cost has not been ascertained officially, but the usual estimate is that it costs $1,000 a year to support an American soldier in the tropics, and thousands of them have been sent down there. Of course, the bulk of this would have been spent whether such help was rendered or not, for the Marine Corps is maintained even though it sees no active service.

OUR COUNTRY'S COLONIAL ACHIEVEMENTS

But out of it is growing results of which a nation which covets no territory, which seeks only its own security and the welfare of its unfortunate neighbors, may well be proud.

In Porto Rico we have reduced the death rate from 45 per 1,000 to 19 per 1,000, and a beginning along the same lines is being made in these new fields of American altruistic endeavor. In Porto Rico wages have increased from 16 cents to 75 cents, and stable conditions show encouraging results in the same direction in our new ward lands. In Porto Rico the school attendance jumped from 20 per cent to more than 85, and these new wards are trying to follow in Porto Rico's path.

Wherever America has gone, whether to Cuba, whether to Panama, whether to



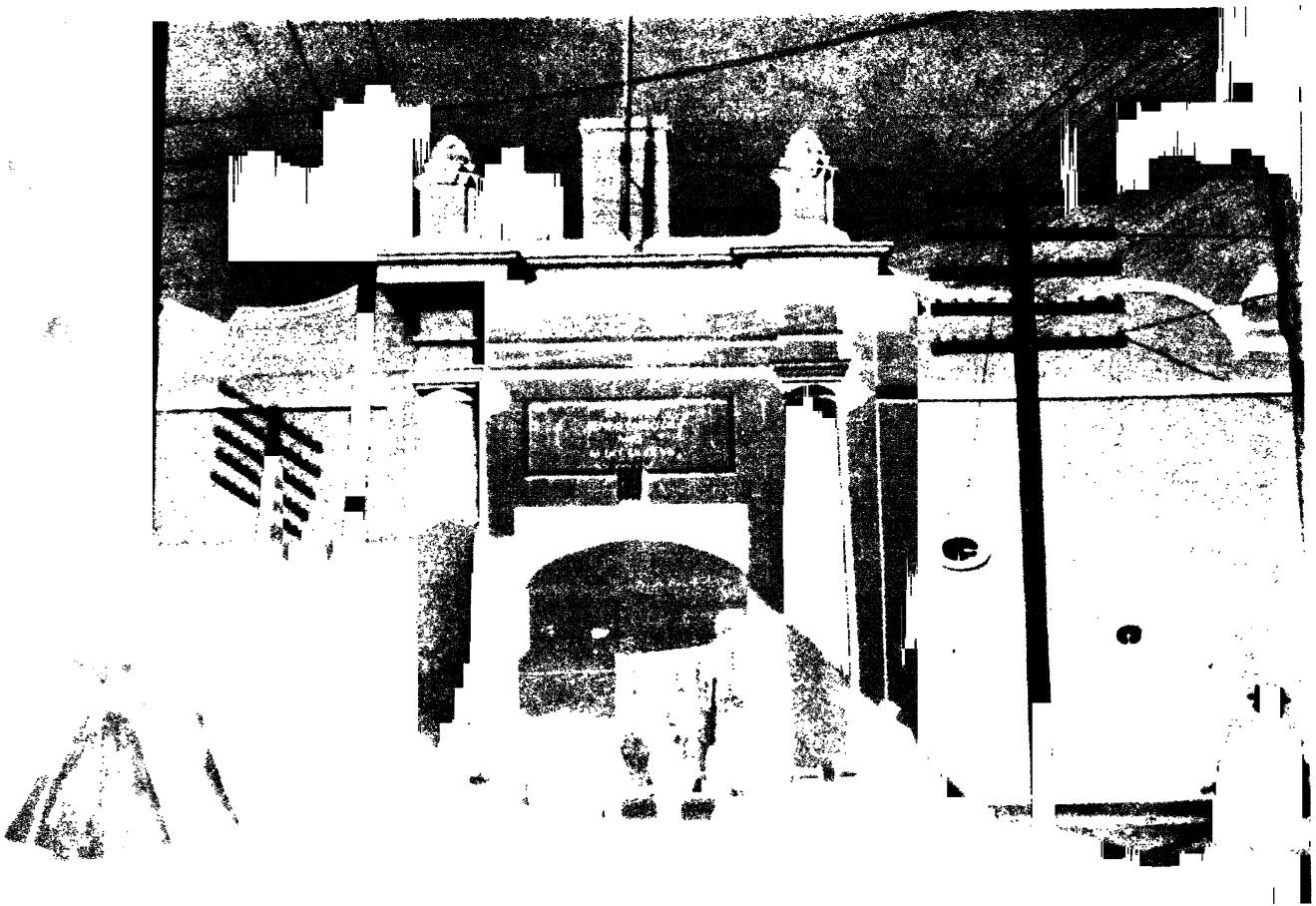
SORTING COFFEE BY HAND: HAITI

When the French were driven from the Island of Haiti it was one of the richest coffee-growing regions in the world. Little has been done in the development of this industry during the century that has followed, and while Haiti still produces enormous quantities of the aromatic berry, it is due to the natural exuberance of the soil and not to the care taken of the trees. Indeed, it is said that most of the coffee trees now at a producing age in Haiti are of volunteer growth.



A STREET SCENE IN PORT AU PRINCE, HAITI

American naval officers whose duties have carried them to the ends of the earth, and to the most insanitary of the world's cities, have declared that the stench of Port au Prince offers more offense to the sense of smell than the odors of any other spot they have visited. Open sewers, decaying fish, dead animals, and whatnot made the City Dreadful before the Americans applied the same methods they used in the Havana-Panama clean-up.



Photograph by Harriet Chalmers Adams

GATEWAY OF "HOMENAJE," THE OLDEST FORT IN THE NEW WORLD: SANTO DOMINGO CITY

It is a fascinating experience to visit Santo Domingo and wander amid the ruins of the ancient city—from the old fortifications to the first stone church built in the New World and to the tomb of the Great Discoverer. Nowhere else in this hemisphere are there scenes fraught with more historical significance to Americans than here where Columbus had his hour of triumph and his hour of sorrow, and where, when he had embarked upon the Great Voyage from which he would never return to endure the fickle favor of petty princes, his ashes finally found repose.



Photograph by Harriet Chalmers Adams

ON THEIR WAY FROM SCHOOL: SANTO DOMINGO CITY, SANTO DOMINGO

The inhabitants of Santo Domingo City well may be a proud people. For, in the words of Ober: "What other city of America can boast as its one-time citizens a great discoverer like Columbus, a fifteenth century humanitarian like Las Casas, a monster of depravity like Ovando, and a quartette of conquerors like Velasquez, who subjugated Cuba; Cortez, who conquered Mexico; Balboa, the explorer of Darien, discoverer of the Pacific, and Pizarro, who stole the treasures of Peru?"

Santo Domingo, Porto Rico, Nicaragua, the Philippines, or Haiti, the welfare of the people has been her first concern; and while all colonial history shows that the tares of evil are never absent from the wheat of good, our nation's record of help given where most needed is one that well may challenge our admiration and quicken our patriotism.

The success in Santo Domingan customs administration and debt amortization led to another experiment along the same line a few years later. Nicaragua became revolution-torn, resulting in the overthrow of Zelaya and the conversion of the country from an unspeakable despotism into one of ruinous anarchy. Rival factions issued fiat money as freely as tap water flows from a spigot. The treasury was bankrupt, interest was in default, foreign creditors were threatening through their governments to collect their debts with gunboats and cruisers, and there was not enough money to be had by the party in power even to pay salaries, much less soldiers' wages.

HELPING NICARAGUA ESCAPE THE THROES OF CHRONIC REVOLUTION

In its insecure tenure under these conditions, the party in power was only too willing to save itself, and incidentally the country, by appealing to the United States and by offering to make itself an instrumentality in American hands for the rejuvenation of the nation. The United States accepted the opportunity, and a treaty was entered into giving this country control of Nicaraguan finances and the right to intervene in the interest



OFFICERS OF THE HAITIAN ARMY ON THE STREETS OF PORT AU PRINCE, HAITI

The army officers of Haiti were as fond of gold lace as a mountain girl of bright colors. Small wonder, then, that the regalia of a field marshal was everywhere in evidence. Times have changed, however, and now the American marine in quiet khaki takes the place of the Haitian fire-eater and his resplendent costumes.



Photographs by Mrs. C. R. Miller

HAITIAN SOLDIERS CARRYING COFFEE TO THE WHARF IN ORDER TO GET SOMETHING TO EAT

The pay of a Haitian soldier was small at best, nothing at worst, and at all times insufficient to keep the warrior fed decently. The days for loading coffee on departing ships were great days in Haiti. They were days when the army got a square meal.



THE ENTRANCE TO A SO-CALLED VAUDOUX TEMPLE: HAITI

Every authority on Haiti agrees that vaudoux, or voodoo, worship exists there, and that it is probably a survival of African fetichism. It is agreed by all authorities that now and then in the frenzy of the snake dances the worshipers refuse to be content with anything less than a sacrifice of the "goat without horns"—a living child. When one of the recent presidents of the Republic was assassinated, he carried the emblems of vaudouxism next to his heart, showing that the cult has existed even in the highest places.



THE FISH MARKET: PORT AU PRINCE, HAITI

Situated in a region famous for its fine fish, among them the delectable and plentiful "red snapper," the Haitians eat quantities of salt-cod from Massachusetts waters; and the quality of this imported staple is such as would not find favor in American markets.



Photograph by Harriet Chalmers Adams

STREET SCENE: SANTO DOMINGO CITY, THE CAPITAL

"Still, in spite of it all, Santo Domingo remains one of the most fascinating and inspiring cities in these waters. . . . To walk through its highways and its alleys is to turn over the pages of an old missal illumined with faded gilt and precious colors, the incense-perfumed leaves of which are patched with shreds of gutter journals and interbound with gaudy prints, ballad sheets, and play bills."—TREVES.

of peace during the life of the compact. Controlling the finances after the Santo Domingan plan, the United States arranged a new loan, most of it to be spent in refunding the debts of Nicaragua and the remainder in making certain internal improvements necessary to the progress of the country.

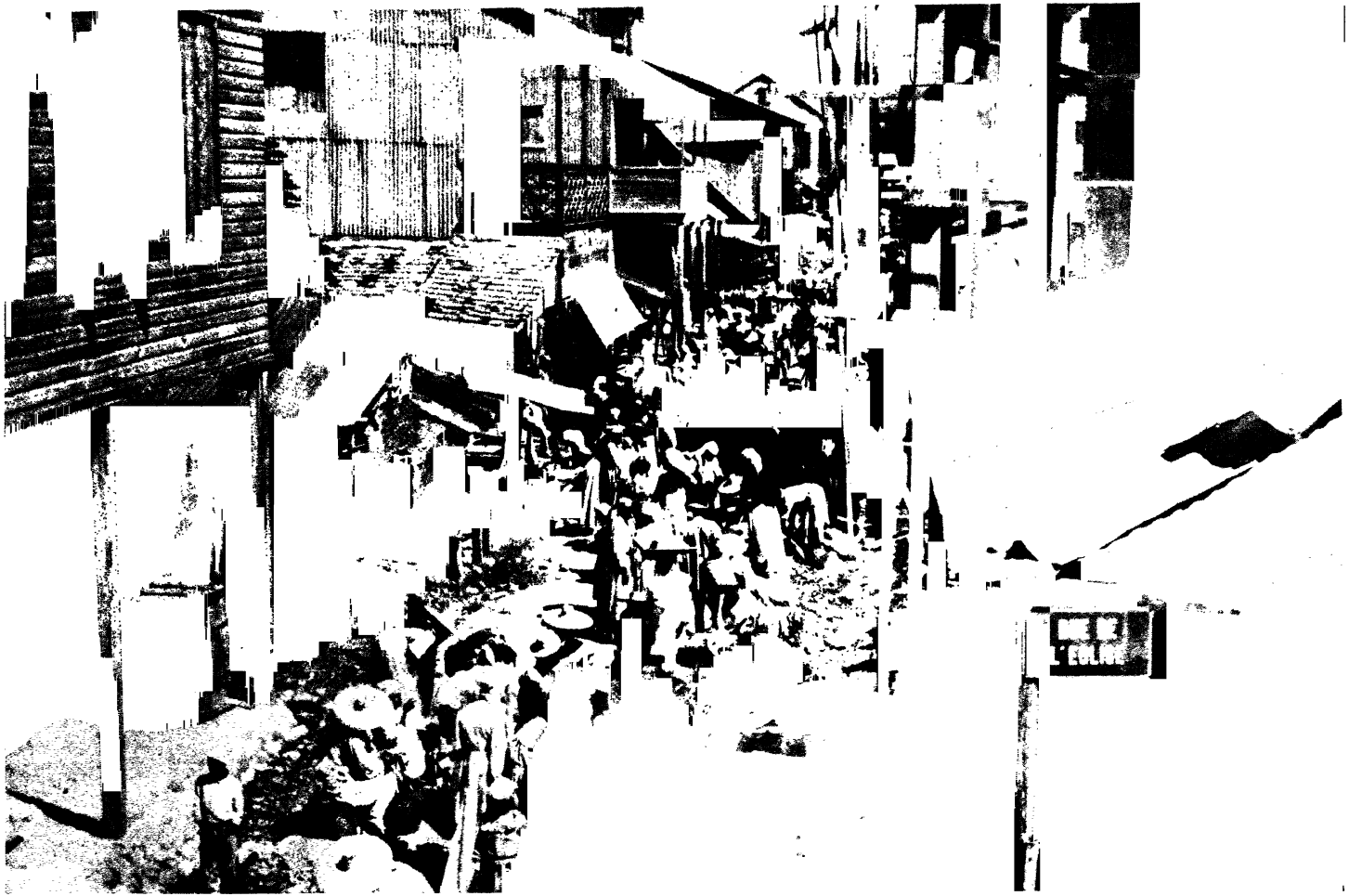
Here, again, the plan worked beautifully as long as hydra-headed revolution remained under cover. Trouble broke out again, however, and only the presence of American marines has served to keep the peace. The "outs" are bitterly against the rôle being played by the United States; but Nicaragua is being rejuvenated, in spite of every handicap that their state of mind entails.

This rejuvenation consists in the placing of the country on a stable financial basis, both with respect to foreign credit and internal investments, the lowering of the death rate through sanitary work, the extension of education through the opening of new schools, and the development of the country through financial arrangements for the construction of a railroad from the west to the east coast, the dredging of the rivers, etc.

That this all amounts to armed intervention no one can deny. But both in Santo Domingo and Nicaragua the step was taken because necessity impelled it. Unless the United States was to be forced to abandon the Monroe Doctrine, it had either to deprive other countries of their remedies or else intervene itself.

But it was and is an intervention only to discharge our international duty to the countries of Europe under the Monroe Doctrine and to rescue the countries in which we intervened from this hopeless morass of perpetual bloodshed and their people from the quicksands of unending riot.

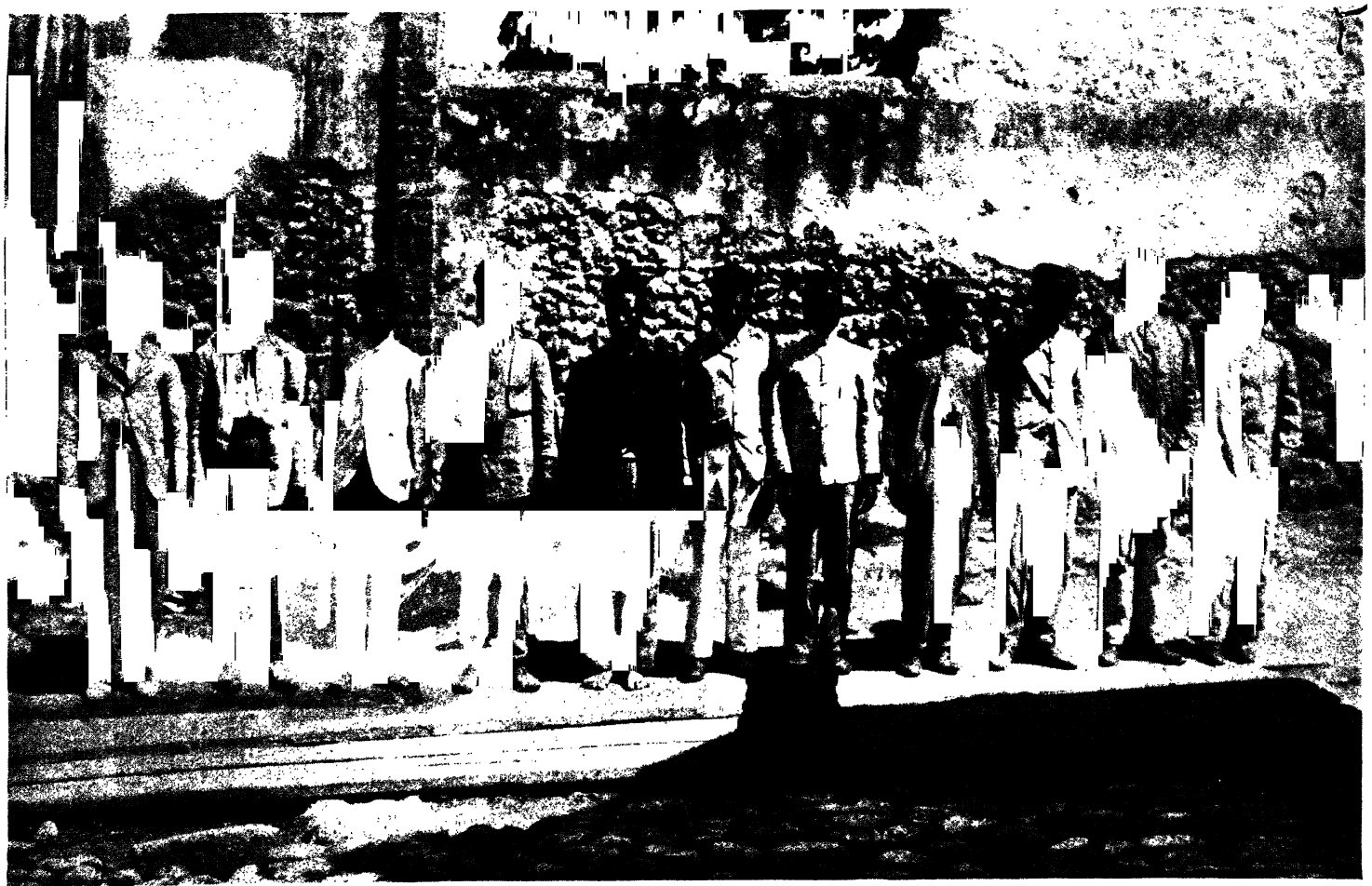
If conditions were bad in Santo Domingo when the United States undertook to help the country back to peace and prosperity, they were worse in Nicaragua when we assumed the rôle of guardian. But even in Nicaragua they were mild indeed as compared with those obtaining in Haiti when our country finally stepped in there.



Photograph by Mrs. C. R. Miller

A STREET IN JACMEL, HAITI

f the American protectorate over Haiti does nothing else but clean up its cities, an infinite service to an indifferent people will have been rendered



Photograph by Mrs. C. R. Miller

TYPICAL HAITIAN SOLDIERS

Feeding the Haitian armies in the days before the American "Big Brother" movement was not a difficult job. Garrison rations consisted of a sugar-cane stalk two or three feet long, and whatever else the soldier could beg, borrow, or steal!



AMONG THE MOUNTAINS OF THE BLACK REPUBLIC

While most of the territory of Haiti is covered with a jungle growth of bewildering density, there are many mountain sides which are brown and bare, the result of centuries of erosion.



Photograph by Harriet Chalmers Adams

THE STRONGHOLD OF CHRISTOPHE

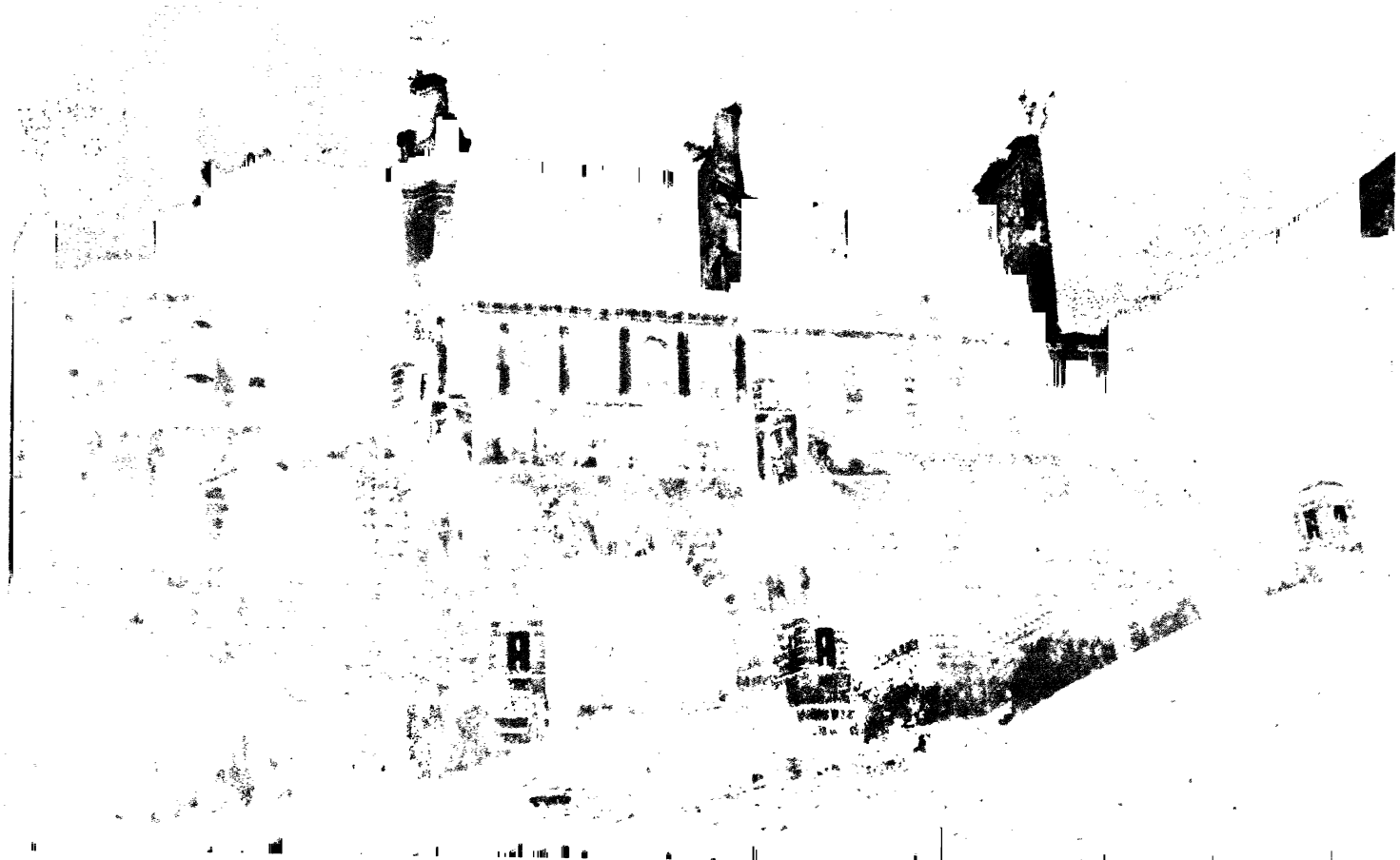
"Two hours further back in the hills stands the stupendous castle erected by the King as a retreat when the French should come to avenge his murdered masters. They never came, having had enough of Haiti; but there Christophe immured himself behind walls twenty feet in thickness and a hundred feet in height, in the long galleries and on the parapets mounting more than three hundred cannon, most of which may be seen today. Here at last died the great black king, self-slaughtered by a silver bullet driven into his brain."—OBER.

CONDITIONS UNBELIEVABLY BAD

Conditions always have been unbelievably bad in that Republic. To begin with, it is a place where black rules white, where the Caucasian is referred to as the "blanc," just as we refer to the "negro." Froude, whose verdict agrees with those of Sir Frederick Treves, who lived in the island; Sir Spencer St. John, who was for 15 years British Minister there, and F. A. Ober, who spent the best part of two decades studying the islands of the Caribbean, says of the Haitians: "They speak French still; they are nominally Catholics still; and the tags and rags of the gold lace of French civilization continue to cling about their institutions. But in the heart of them has revived the old idolatry of the Gold Coast, and in the villages of the interior, where they are out of sight and can follow their instincts, they sacrifice children in the serpent's honor after the manner of their forefathers."

Sir Spencer St. John adds to this the statement: "I have traveled in almost every quarter of the globe, and I may say that, taken as a whole, there is no finer island than that of Santo Domingo—Haiti. No country possesses greater capabilities, or a better geographical position, more variety of soil, of climate, and of production, with magnificent scenery of every description, and hillsides where the pleasantest of health resorts might be established, and yet it is now the country to be most avoided, ruined as it is by a succession of self-seeking politicians, without honesty or patriotism, content to let the people sink to the condition of an African tribe, that their own selfish passions may be gratified."

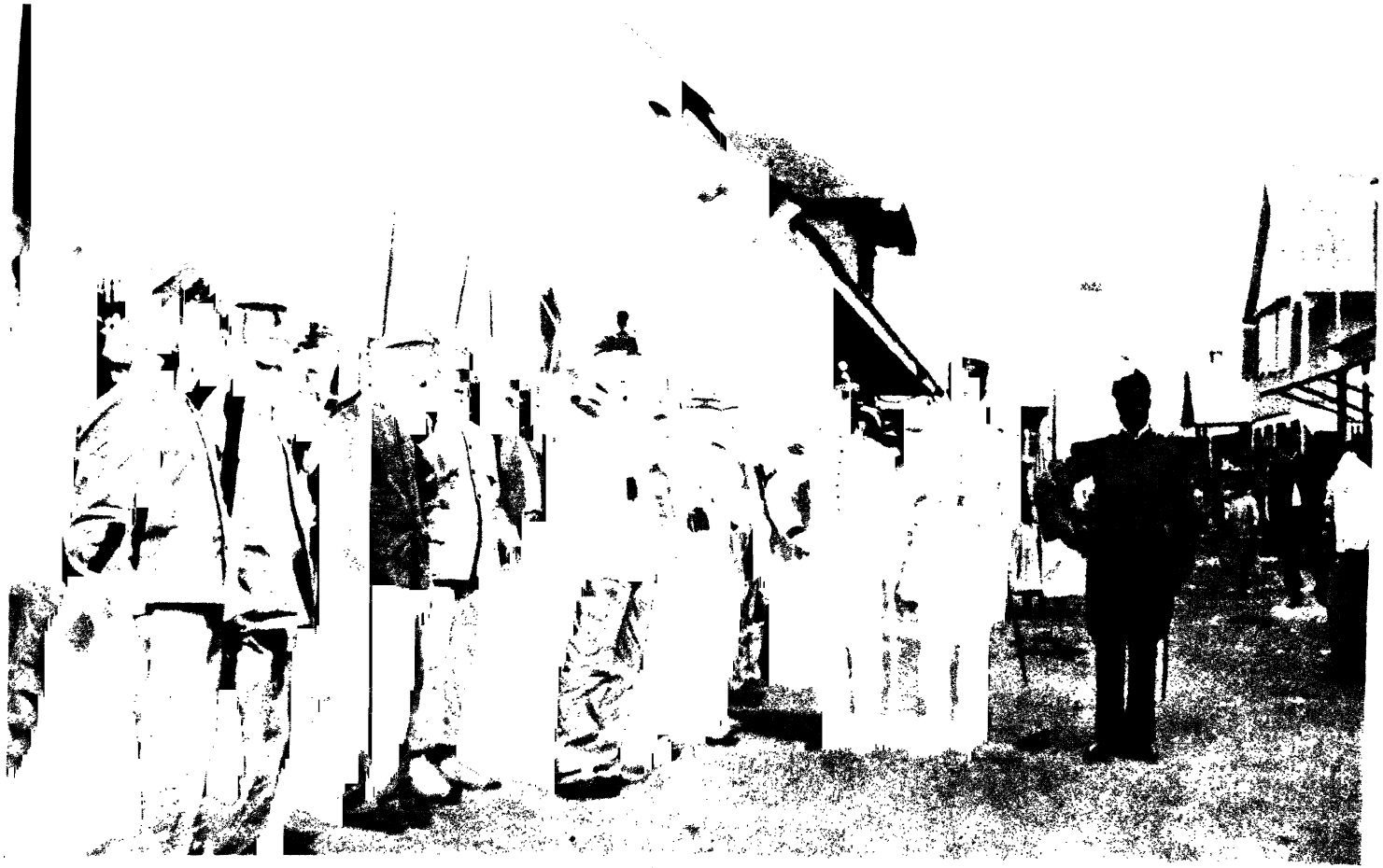
F. A. Ober, commenting upon the story of the country written by Sir Spencer,



Photograph by Harriet Chalmers Adams

THE PALACE OF SANS SOUCI, BUILT BY CHRISTOPHE

This remarkable edifice is situated in the hills above the level vale Milot, with a background of forest and a foreground sprinkled with palms and the huts of simple cultivators. Dilapidated ruins and a tangle of tropical trees are the rueful remnants of the glory that was once the Palace Without Care and the gardens of delight of the King of Slaves—Christophe.



Photograph by Harriet Chalmers Adams

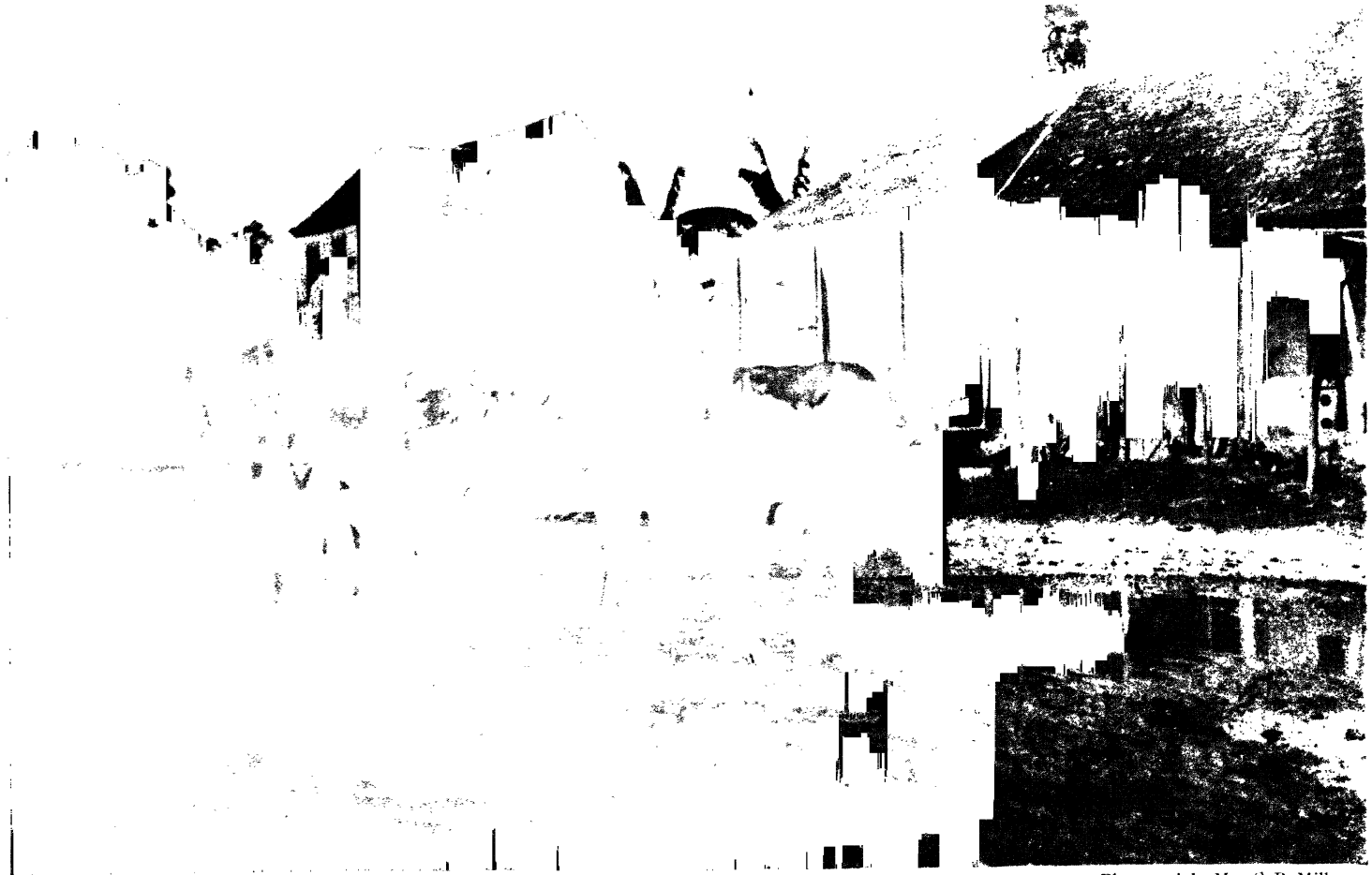
SOME OF THE GENERALS IN THE HAITIAN ARMY BEFORE THE AMERICAN OCCUPATION

When one of our diplomatic representatives visited Haiti a few years ago, President Laconte told him he was reducing the size of his army, and that the generals mustered out of service were put to breaking rock on the street. At one time there were more officers than men in the Haitian army, according to apparently authentic statements.



A HAITIAN COUNTRY HOME OF THE BETTER CLASS

The Haitians live in a land of almost unexampled fertility. Drought and frost are both unknown. The soil is wonderfully fertile and nothing but sheer lack of initiative and industry keeps them from becoming rich.



Photograph by Mrs. C. R. Miller

A TYPICAL COUNTRY ROAD IN HAITI

It is over such roads as these that Haiti sends its products to market. Compared with the roads of Jamaica, Cuba, or Porto Rico, they furnish eloquent testimony as to the economic backwardness of this land of potential riches.



THE PRESIDENT AND STAFF, PORT AU PRINCE, HAITI

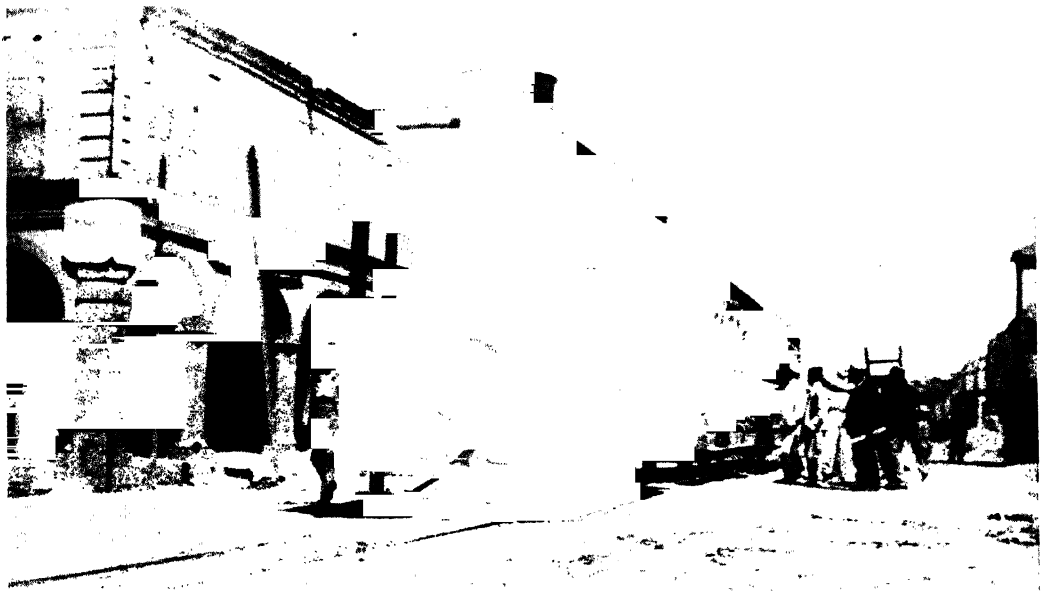
The marine in the background tells the story of the presence of the American force in Haiti. The Haitian soldiers have been organized into a constabulary under the direction of American marines, and many of the latter have been promoted from the ranks and are now officers.

tells us "he scathingly arraigns the Haitians and gives details of the revolting practices of the Vaudoux and the cannibals of the country. There is too deep a belief in the almost preternatural power of the *papa-lois* and *maman-lois* (high priest and priestess of the Vaudoux), and the dread of the terrible *loup-garou*—the human hyena that kidnaps children, buries them alive, and then resurrects them for the sacrifices—is too pervasive and real to permit of denial by those who have to live in Haiti and endure the evils they cannot remedy."*

It was Dessalines who led the forces which defeated the French, massacred their women and children, and set up an independent government. From that time, 1804, to the present they have had 28 rulers, including a king and an emperor. Of these only 4 completed their terms of office, 2 died in power, 5 were assassinated, 10 were exiled, 1 committed suicide, and 1 abdicated under compulsion.

Of Christophe, the second ruler, Sir Frederick Treves gives us this glimpse: "To Dessalines succeeded Christophe, one of the most ludicrous figures in modern history. He was a mulatto slave, who took upon himself the title of Henri I. He created a copious black aristocracy, whereby the water-side porter became a duke, and the footman a marquis. He drew up a code of laws, the Code Henri, in imitation of the Code Napoleon. His court was as gorgeous as the court in an opera bouffe. More than that, he built

*See also "Haiti, a Degenerating Island," by Rear Admiral Colby M. Chester, U. S. N., in NATIONAL GEOGRAPHIC MAGAZINE, March, 1908.



Photograph by Mrs. C. R. Miller

STREET-CAR SERVICE IN PORT AU PRINCE, HAITI

The Haitian street railroad makes one think of the old-time elevated train service in New York. The engines are rusty, leaky, and carry smoke-stacks seemingly huge enough for a trans-Atlantic liner.

the palace of Sans Souci, an unbelievable edifice worthy of the 'Arabian Nights.' The ruins of this fantastic edifice still crown certain gracious heights near Cape Haitien. Henri I did one wise thing: he shot himself after a burlesque reign of some thirteen years." He might have added that the fastidious Christophe used a silver bullet; lead was too plebeian for his brain.

THE DUKE OF LIMONADE

Another ruler was Soulouque, an illiterate and superstitious negro, who, under title of "Emperor Faustin I," established a "nobility," among the recipients of his honors being His Grace the Duke of Limonade and His Highness Prince Bobo.

In 1912, when the Knox Mission to Latin America visited Port au Prince, President Laconte was in power. The city then thoroughly fitted Ober's description of it when he wrote: "As to Port au Prince, I can bear testimony respecting its utter filthiness, and agree with a recent resident there that it may bear away the palm of being the most foul-smelling and consequently fever-stricken city in the world. Every one throws his refuse before his door, so that the heaps of manure and every species of rubbish incumber the way. The gutters are open, pools of stagnant water obstruct the street everywhere, and receive constant accession from the inhabitants using them as cesspools and sewers."

But conditions were good then to what they became later. Laconte had set some of his generals to breaking stone for macadamizing the streets, and white residents said that the town was cleaner that year than it had been in their memory.

A REIGN OF TERROR

But Laconte did not rule long. He was assassinated, the palace was burned down, and there was inaugurated a carnival of crime, and an orgy of revolution such as history perhaps never before was called upon to record. Indeed, the four years that began with the assassination of Laconte and ended with the surrender of the last rebels to United States authority were a nightmare of terror.

In one case the body of a dead ruler



HAITIAN SCHOOL CHILDREN OF THE BETTER CLASS

Although Haiti has been the victim of very bad government, at the same time it is probable that more attention has been paid to general education there than in the majority of tropical American countries.



Photographs by Mrs. C. R. Miller

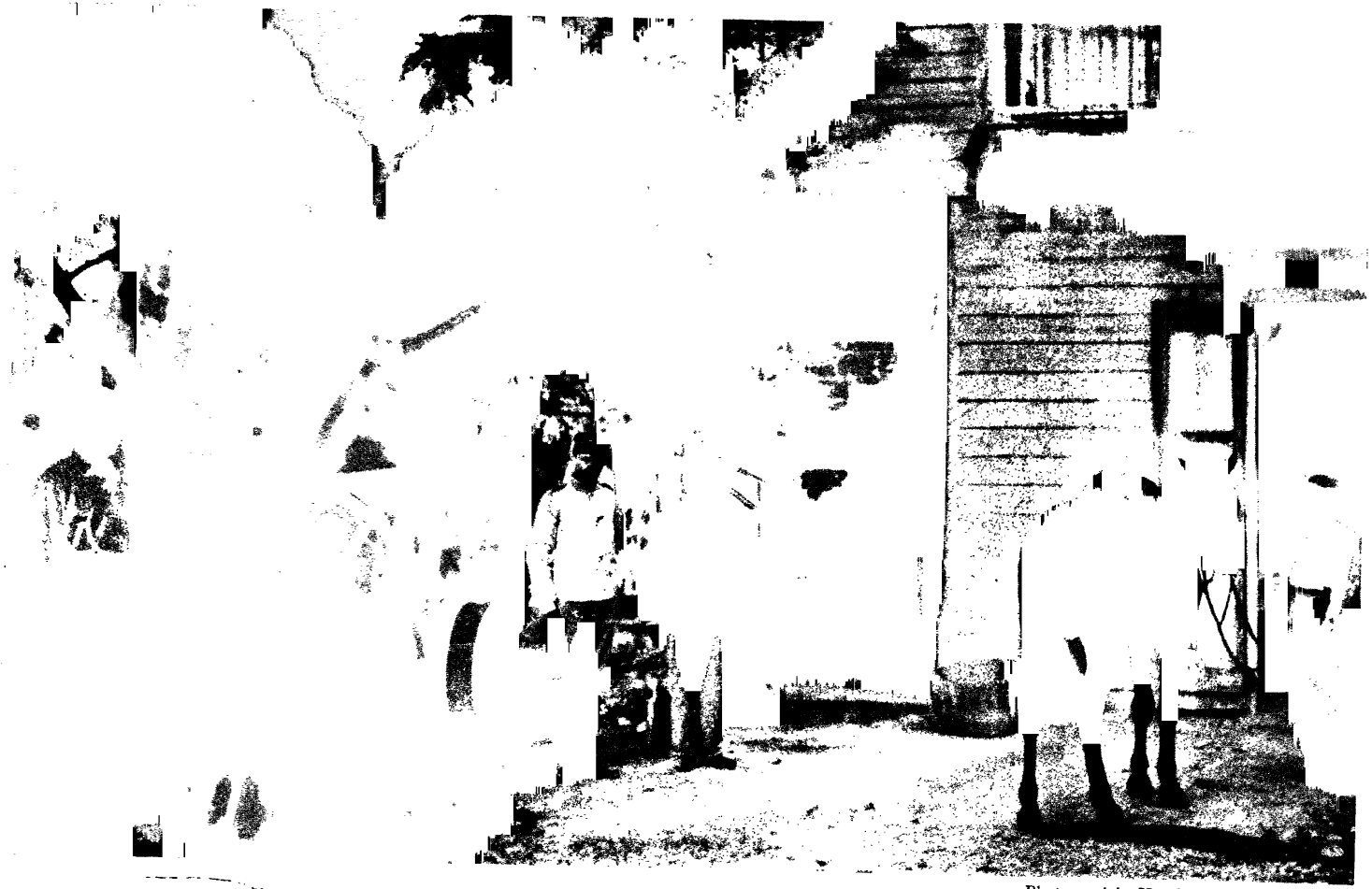
HOME LIFE IN THE COUNTRY: HAITI

The inhabitants of the country districts of Haiti are warm-hearted, polite, good-natured, and usually care less for the morrow than for the pleasures of the moment



SADDLE MOUNTAIN, NEARLY 9,000 FEET HIGH, THE HIGHEST PEAK IN HAITI

The King of England once asked one of his admirals who had visited the West Indies about the appearance of the Island of Haiti. The old sea dog took up a piece of paper, crumpled it in his hand, and laid it on the table. "That, your majesty," he declared, "is a fair illustration of Haiti." No island of equal area in the New World, perhaps, has as many or as high mountains as Haiti.



HOUSE OF A HAITIAN SENATOR

Photograph by Harriet Chalmers Adams

Haiti is not remarkable for its beautiful residential architecture. Foreigners have had few property-owning rights, and the natives have not been given to the erection of costly homes.



THE FORMER NATIONAL PALACE: PORT AU PRINCE, HAITI

This was the Haitian White House until 1912, when President Laconte was assassinated and the building burned to the ground to cover the crime. It was situated in the Camp de Mars, which Ober well describes as resembling a vacant city lot rather than a public parade ground, being totally devoid of vegetation and encumbered with all sorts of rubbish peculiar to the vacant lot, including the goat and the tomato can.



MOUNTAINS OF HAITI

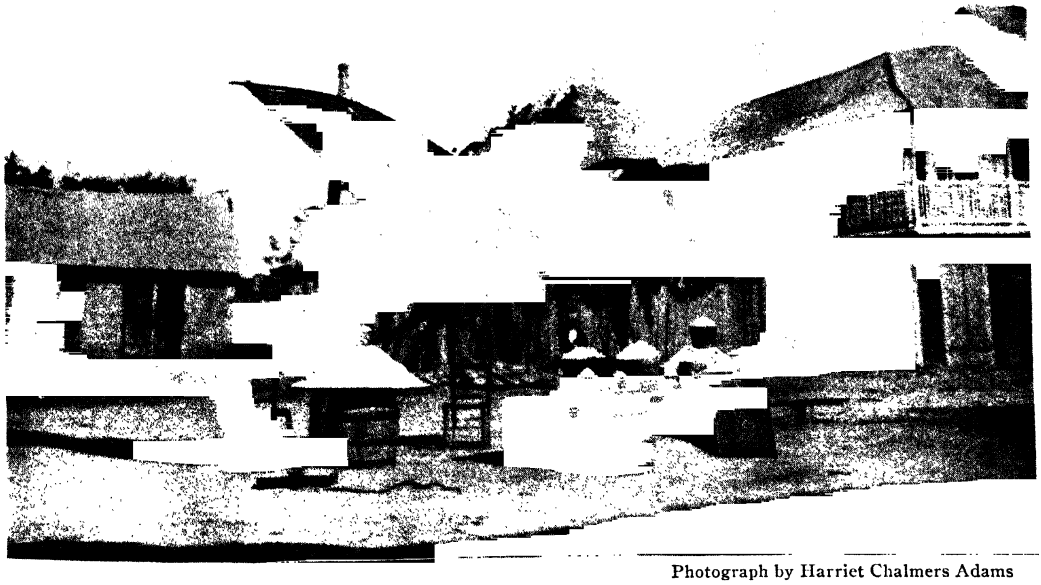
When Nature was distributing her gifts to the islands of the earth Haiti seemed a favorite child, for she bestowed upon it a fertility of soil, an abundance of rainfall, and a wealth of mineral resources that left little to be desired.



Photograph by Mrs. C. R. Miller

A COUNTRY TAILOR AT WORK IN HAITI

There are no "sweat-shops" in Haiti and tailoring is not a very exacting art. The excessively hot climate calls for light-weight clothing, and this is usually imported ready-made from Europe.



Photograph by Harriet Chalmers Adams

THE SALT SELLER: CAPE HAITIEN, HAITI



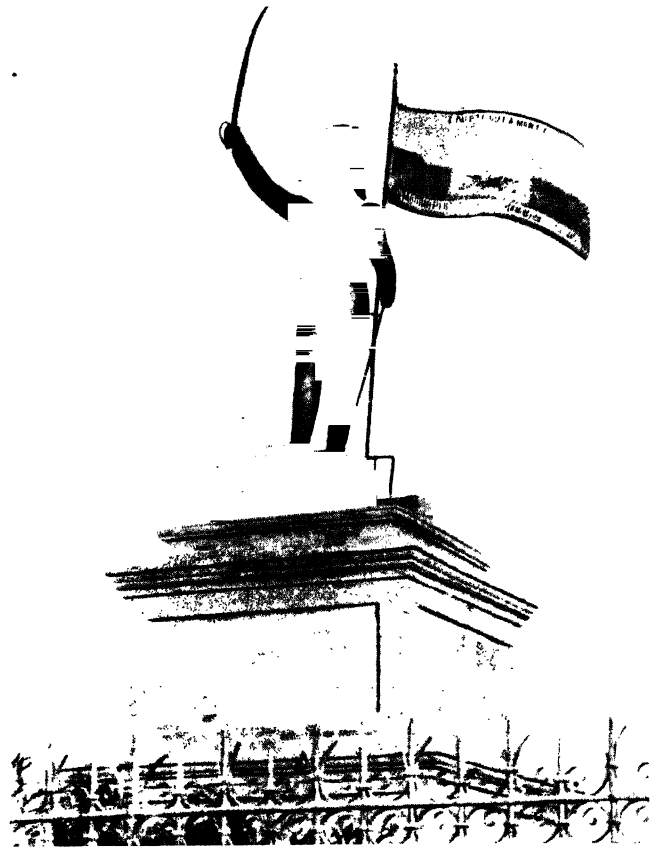
A TYPICAL MARKET-DAY SCENE: PORT AU PRINCE, HAITI

Nearly all the produce for the feeding of the population of Port au Prince, a city of some 60,000 people, is brought in on the backs of donkeys. The public squares are converted into open-air market-places, and here the buying and selling goes on from early morning until 4 or 5 o'clock in the afternoon, when the caravans begin their toilsome journey homeward.

was lying in state in the cathedral, when a military company was drawn up and commanded to fire into the coffin, which they did with riddling effect. In still another case 110 leading citizens were shot and a reign of terror surpassing even past performances was inaugurated.

This in its turn resulted in the storming of the French legation, where President Guillaume Sam, who had ordered the execution of these people, had taken refuge. He was dragged out; his body was drawn and quartered and dragged through the streets.

Before this latest outbreak, which was in July, 1915, there had been numerous threats of intervention, Germany and France at one time acting jointly in their representations. But this outbreak, which had followed repeated efforts on the part of the Washington Government to find a remedy short of intervention, was the straw that broke the patience of the United States and led it, both for its own safety and the protection of the Haitian people and the foreigners domiciled there, to intervene.



STATUE OF DESSALINES, ERECTED 1904

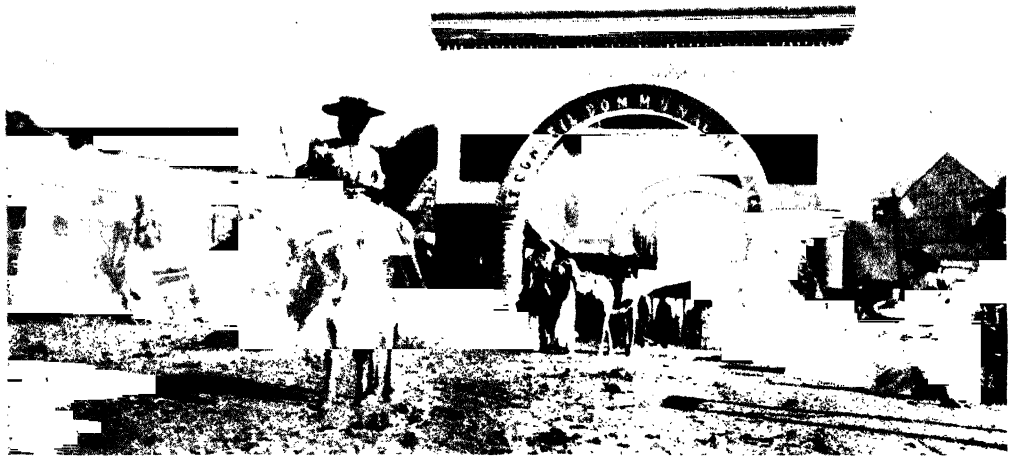
"Then came Dessalines, who, when he had cleared the island of the French, caused himself to be crowned as Emperor of Haiti under the title of Jacques I. His reign, marked as it was by extraordinary debaucheries, was very short, for after he had been two years upon the throne he was happily assassinated."—SIR FREDERICK TREVES.

THE NEW ORDER IN HAITI

A new President, Tudre Dartiguenave, was elected with the approval of the American authorities, and the United States stands behind his government. In return Haiti has entered into a treaty with the United States, which has been ratified by both countries, embodying the principles of the Dominican and Nicaraguan receiverships, together with some new features.

By this treaty the United States practically underwrites a loan of sufficient amount to settle all the legitimate debts of the country and to finance the beginning of its development, opening up its mines, putting its agriculture on a solid basis, and otherwise preparing to make it the region of plenty that nature has equipped it to be.

But the treaty goes further than those with Santo Domingo and Nicaragua. It provides for an American-officered constabulary which shall have control of the peace of the country and the regulation of all matters pertaining to arms and ammunition. Furthermore, it provides for the appointment of a sanitary engineer whose recommendations, as ap-



Photograph by Mrs. C. R. Miller

THE TRIUMPHAL ARCHES OF AUX CAYES, HAITI

The woe-begone donkey in the foreground is a picture perhaps more typical of Haiti as it is than any other that can be imagined. One may see processions which include hundreds of these life-weary creatures traveling to the Haitian markets in the morning and returning with exchanged products in the evening, and frequently carrying women seemingly heavier than themselves.



IN THE CEMETERY: PORT AU PRINCE, HAITI

The Haitian negro is true to type in his love of ostentation and display. The funerals are nearly always elaborate, and the cemeteries are most ornate spots.



VIEW OF THE GRAND RUE: PORT AU PRINCE, HAITI

The character of the architecture of the capital city is well shown in this picture. The rickety boardwalks spanning the gutters, even at the post-office, which is the building in the center with the two flagstaffs, show how primitive conditions really are.



A VIEW OF MILOT, CAPE HAITIEN, HAITI

It was off this coast that the flagship of Columbus was wrecked, and here he left most of his men when he returned to Spain for aid. Upon his return to the settlement, which he called "La Navidad," he found the whole party dead, including an Englishman, named Allard, and an Irishman who was entered on the *Santa Maria's* books as William of Galway.



Photograph by Mrs. C. R. Miller

AN OUTDOOR KITCHEN IN HAITI

The simple life and life in the open are lived in Haiti; but indifference to dirt and a disregard of the most fundamental laws of sanitation result in a high death rate despite all

proved by the United States, are to be carried out in the cleaning up of the cities of the Republic.

This new departure probably will insure peace, quiet, honest administration; and if it does, Haiti will certainly go forward as few small countries ever have. Its mountains are filled with mineral wealth; its valleys are so fertile that the slightest attention can make them produce like an Eden; its forests contain vast stores of precious hardwoods and dyewoods. It is, indeed, a region where nature has lavished its richest gifts, and where a simple population, under a firm yet gentle, beneficent guidance, may realize the blessings of tranquil abundance.

SIZE AND APPEARANCE OF THE ISLAND

Some one has roughly compared the Island of Haiti to a huge turtle swimming eastward on the line between the Atlantic Ocean and the Caribbean Sea. The head and the forward three-fourths of the body are occupied by the Dominican Republic, while the hind legs and the other fourth of the body are under the sovereignty of the Republic of Haiti.

It contains approximately 28,000 square miles of territory, being not quite as large as the State of South Carolina. The part occupied by Santo Domingo is a little smaller than the combined areas of Vermont and New Hampshire, while that occupied by the Republic of Haiti is not quite so large as the State of Maryland.

Although the Republic of Santo Domingo has nearly twice as much territory as that of Haiti, its population is less than one-third as large as that of the black republic. This has resulted in bitter feeling between the two nations—a feeling that is a century old. The Haitians have repeatedly tried to get a slice of Dominican territory, now by open war, and now by rival boundary claims; but to date they have not succeeded, and it is to be presumed that the influence of the United States during its protectorate will be against any reopening of this issue.

The island of Haiti is one of the four of the Greater Antilles and the second in area and population. It is the only island in the West Indies besides Cuba that is independent. It got its name from a Carib word meaning "mountainous" or "high land." Columbus, who established the first settlement in the New World on its northern coast, renamed the island, calling it Hispaniola.

It is about 400 miles long, varying in width from 24 to 165 miles. It is covered with densely wooded mountains, with a large number of beautiful and fertile valleys between them. Loma Tina, which towers over 10,000 feet above the sea, is not only the roof of the island, but of all the West Indies. The average height of the main mountain range is about 7,000 feet. There are many rivers, but they are usually short and swift, the alluvial plain being very narrow.

A LITTLE JOURNEY IN HONDURAS

By F. J. Youngblood

HAVING occasion a short time ago to travel through Honduras, I endeavored, before leaving Los Angeles, to gain some idea of how the trip should be undertaken, but found I could obtain very little information about the country and practically no details in regard to climate, trails, necessary equipment, etc. What few bits of stray information I did get proved, as a rule, entirely incorrect, and it is possible that what I learned by experience may be of some slight assistance in saving another traveler both trouble and money at some future time. And it will be found that the lack of information in traveling in Central America is a greater handicap than almost anywhere else.

There are two chief arteries of travel in Honduras—one from Amapala, on the south coast, to Tegucigalpa, the capital, and the other from Puerto Cortés, on the north coast, to the same place.

Starting from the United States, it will



VIEW OF COMAYAGUELA, WHICH IS PRACTICALLY A PART OF TEGUCIGALPA, HONDURAS

This picture was taken after the rebuilding of the bridge shown in the illustration on page 182



Photographs by F. J. Youngblood

AN EXAMPLE OF NATIVE HOUSES OF THE BETTER SORT

It is in such shelters as this that the traveler must spend most of his nights on the trail from the ports of Amapala and Puerto Cortés to the capital

cost practically the same amount to reach Tegucigalpa by either port of entry; but the time taken and the inconveniences met with on the two roads are vastly different. To reach Amapala, a steamer may be taken at San Francisco. The voyage, as a rule, occupies 22 days, not because this length of time is necessary to cover the distance, but because the boats are slow, carry cargo, and stop for a few hours, or it may be for a few days, at ports in Mexico, Guatemala, and Salvador. For the traveler who is in no hurry, this voyage is extremely interesting. Our ship touched at Mazatlan, Acapulco, and Salina Cruz, in Mexico; Ocos, Champerico, and San José, in Guatemala; Acajutla, La Libertad, and La Union, in Salvador. We anchored for three days off San José, and many of the passengers took advantage of the opportunity to visit Guatemala City, almost a day's journey inland.

A PICTURE OF AMAPALA

On arriving at Amapala, I received courteous treatment everywhere; in many cases the natives of the country must have gone to considerable trouble on my account, and on one occasion the foreman of a hacienda where I had been stopping swam his horse across a river seven times to assist a friend and myself with our baggage; yet we were "Gringos," whom he would probably never see again. In Amapala arrangements must be made to continue the journey to Tegucigalpa by mules. There are only a few miles of railroad in Honduras, on the north coast, and as transportation is primitive it is best to understand that in crossing or going through Honduras conveniences must be forgotten; there are no particular hardships to be borne or dangers to be faced, but the creature comforts of home are missing.

From Amapala a launch is taken to San Lorenzo, where the necessary mules should be arranged for in advance, since they have to come from Perspire, a town some miles away. If a light pack is all the traveler has, it can be taken with him on a mule; otherwise it is better and cheaper to send heavy baggage forward by ox-cart, and, naturally, this will take considerably longer. Tegucigalpa should be reached in three days, there being a fairly good road all the way. As it is a constructed road and not a trail, 25 days from San Francisco may be considered the length of time required by this route.

A PUZZLING FINANCIAL SYSTEM

The monetary system of the country should be studied immediately upon landing. The standard is silver and the rate of exchange is two and one-half to one; in other words, the Honduran dollar (peso or sol) is worth 40 cents gold. Funds should be taken from the States in gold coin only; this will pass everywhere and is eagerly sought for by the merchants. The paper money of the country is as good as the silver, but away from the large towns and cities it is hard to get small change for a bill; hence it is advisable always to have a good supply of silver to pay the charges met with here and there on the road.

A mozo or servant should also be hired with the mules. He is an absolute necessity to the stranger and is usually sent to you by the owner from whom you have hired the animals. The mozo practically arranges your day's journey; he packs and saddles your mules, shows the way, does any odd thing you wish while on the road, and may be depended on always to get you a house for the night, for, except in Amapala, Tegucigalpa, Puerto Cortés, or the largest places, so-called hotels cannot be found.

HOSPITALITY AND CURIOSITY

As a rule, the night will be spent in a native house, sometimes little more than a hut, built of mud, thatched or roofed with tiles. One is apparently always welcome to the best the house affords; but a hammock as part of the traveler's outfit is a necessity, for the beds of stretched bull-hide or canvas are usually fully occupied, if not by those at whose home you are a guest, then by other residents greatly to be feared.

Everybody sleeps in one room—men, women, and children together. Your hosts are curious, but politely so, watching you undress and get into your hammock, with a calm stare that must not be



Photograph by F. J. Youngblood

THE SEVENTH AGE OF WOMAN IN HONDURAS

On the visage of this centenarian the pencils of Poverty and Privation, as well as that of Time, have drawn countless indelible lines of suffering and sorrow. The crutches which guide her tottering steps are crude forked sticks which are a torture as well as an aid. At her side are the sturdy children of the third or fourth generation. And here, as in every other corner of the globe, the doll is the girl's dearest treasure.



Photograph by F. J. Youngblood

IN THE MARKET-PLACE: TEGUCIGALPA, HONDURAS

Burdened with one of the heaviest per capita debts in the world, Honduran people still manage to eke out a living. If the United States owed as much in proportion to its population, we would have a national debt of twenty-two billion dollars.

considered impertinent, for a white man is not an every-day visitor. I, myself, rarely undressed completely. Sometimes I would only take off hat, coat, and boots; sometimes only my hat, for sleeping in one's clothes becomes second nature after awhile, and bathing and changes of linen can be better indulged in along the roadside.

THE CITY OF TEGUCIGALPA

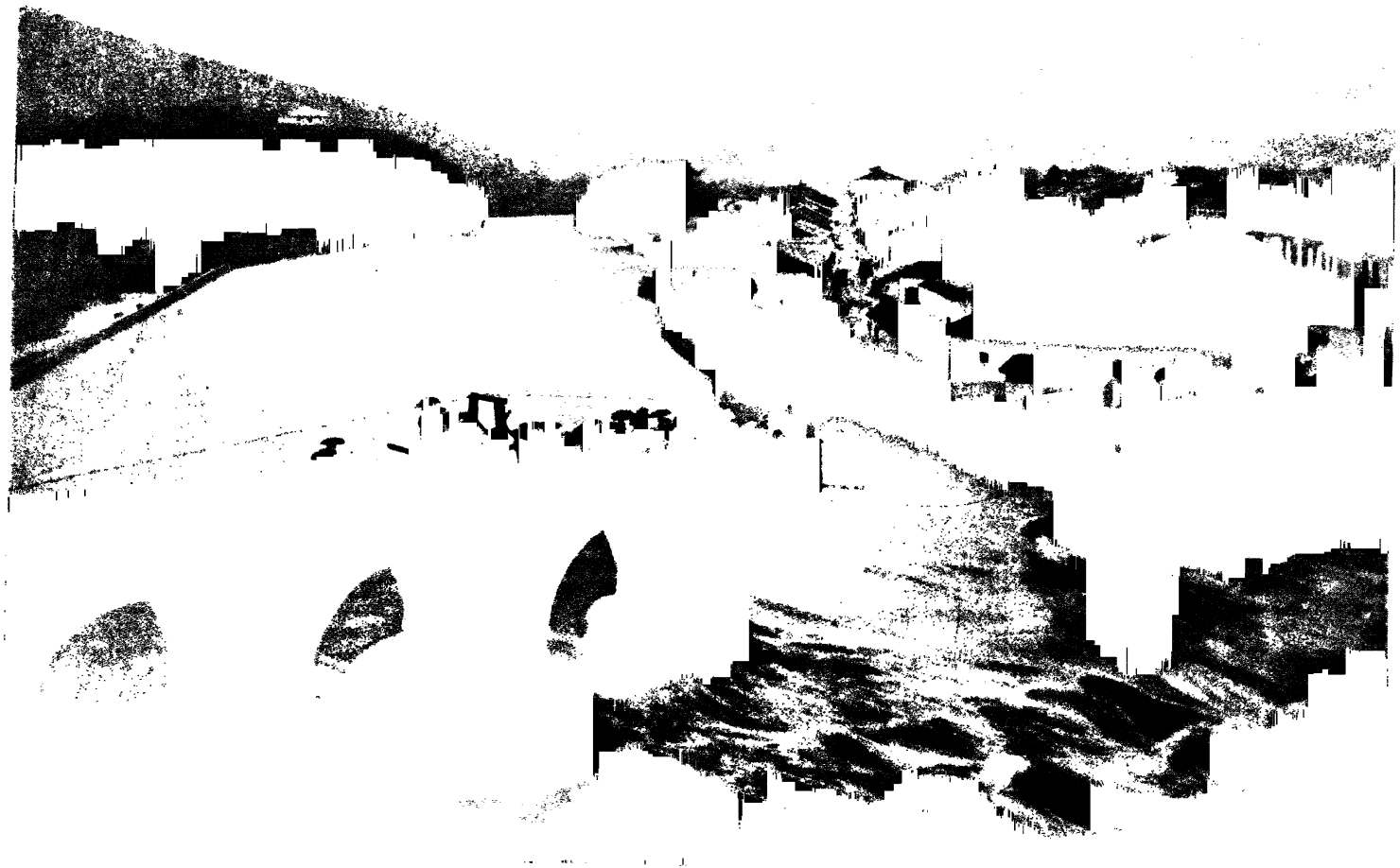
Arrived in Tegucigalpa, one discovers that it is not necessary to carry a large outfit from the States. The city, with the adjacent town of Comayaguela, boasts a population of from 12,000 to 15,000 and has many good stores where almost all the ordinary things required on such a trip can be purchased.

Were I to cover the ground again, my pack would be a very light one, probably weighing less than 100 pounds, and would contain several suits of khaki, some light flannel underclothes and outing shirts, two or three pairs of high boots, rubber boots, a rubber riding coat, and a few personal necessities.

If a long trip into the interior from Tegucigalpa is intended, a supply of canned food should be obtained in the city; but along a regular trail tortillas, beans, rice, some sort of meat, coffee, and a few other things can usually be obtained at small cost. The cooking is fairly good, though monotonous, and the extras carried in the way of sardines, compressed soups, bread, or biscuits in tins, etc., is merely according to individual taste, although bacon, tea, flour, and the other foods will always come in handy, as the natives are not hearty eaters and their supply is sometimes limited. Everything mentioned can be purchased in the city or from the mining company store, which has an office there.

A SHORTER ROUTE

But continuing the comparison of the two ways of getting into the country, we have already noted that approximately 25 days are required via Amapala. Puerto Cortés may be reached by any one of several fruit-line steamers running from New Orleans or Mobile. The mail boats from New Orleans take between five and



A VIEW OF TEGUCIGALPA, HONDURAS

Photograph by F. J. Youngblood

This picture shows the seething waters of a mountain torrent in freshet season just after a section of the principal highway bridge of the capital city has been swept away. Such a mishap is a calamity in Tegucigalpa, for, unlike any other capital city in North or South America, its only means of communication with the seaboard is over wagon roads (see page 178).



A TYPICAL NATIVE FAMILY GROUP OF THE INTERIOR

Photograph by F. J. Youngblood

There is no race suicide in Honduras, but infant mortality is pitiably high. The people are hospitable, and are ready to share bed and board—the bed often the bare floor, and board little more than tortillas, frijoles, and coffee—with the wayfaring traveler.

six days to make the trip, as they call at various ports on the coast; the Mobile boats make the run in three and four days.

From Puerto Cortés a railroad runs to La Pimienta, which means another day, although the distance is less than 60 miles. There begins a five or six days' ride on mules over fairly hard trails, which are very bad in spots.

Honduras is a country of hills and valleys; of rain and sunshine; of large and small rivers. A half dozen rivers may be crossed in one day, and, while they are usually narrow and shallow, a few hours' rain will turn them into roaring torrents, absolutely impassable. I have been held up for five days by a stream that when I first crossed it was less than three feet in depth. When I wanted to cross the second time, a few weeks later, it had been raining, and even the natives remained on whichever side they chanced to be until it went down again. But, given favorable conditions, the Puerto Cortés journey may be said to be only one-half as long in time taken as the route via Amapala.

GENERAL CLIMATIC CONDITIONS

Honduras is not an unhealthful country, but a small medicine case of standard remedies should be taken. Quinine is the most useful of all. Along the rivers and on some parts of the coast fevers are to be expected at times, but are not so frequent in the interior at altitudes of 1,000 feet or more.

On the south slope of the country the rainy season extends from about the last of June to the first of November; on the north slope it begins earlier and lasts longer.

In time the country will be far better known than it at present seems to be, for it undoubtedly holds great mineral wealth among its natural resources.

There are no flour mills, yet three crops of wheat can be raised a year; there are no sugar refineries, yet cane grows luxuriantly; there is no cotton industry, yet cotton will bloom all the year round; bananas are raised on the north coast, yet they will grow as well in the interior, but there is no transportation for them or for anything else.

Honduras is said to be the most backward of all the Central American republics, and she will remain so until railroads cross the country and the government becomes stable. Then there will be great opportunities here for many, and Americans and American capital will always be welcome.

The country is just a little larger than the State of Pennsylvania, yet it has a population of only a little more than half a million. It has the largest per capita debt of any country on the face of the globe except New Zealand—at least it had before the present European war upset all statistical conditions. It owes $220 per capita. Most of this debt was created by loan-shark methods, however, for Honduras would agree to pay $10 to get one—or some such ridiculous proportion.

The name of the country is said to be derived from a Spanish term meaning "depth," the early explorers having found difficulty in striking water shallow enough for anchorage. They were so delighted when they reached the Nicaraguan shore near by that they called the headland "Cape Gracias a Dios" (Cape Thanks to God), a name it still holds.

Honduras, Salvador, and Nicaragua all border on Fonseca Bay, one of the finest harbors on the west coast of either America. Guatemala and Salvador have also built a link of railroad between Zacapa and La Union, which makes another transcontinental railway. It is the conflict of the interests of these States that produced the protests of Central America against the treaty between Nicaragua and the United States, involving canal and naval rights in that bay.

It may be added that a knowledge of Spanish, attending strictly to one's own business, and a realization that the natives are far from being savages will help a person get through the country better than a revolver, although the latter may be carried for a case of extreme emergency. However, the ability to speak a little of the language is the most important thing of all.

INDEX FOR JANUARY–JUNE, 1916, VOLUME READY.

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THE NATIONAL GEOGRAPHIC MAGAZINE

ROUMANIA AND ITS RUBICON*

BY JOHN OLIVER LA GORCE

FEW States in history have been called to such momentous decisions as Roumania faced when it plunged boldly into the Niagara of blood and carnage that has rolled down over Europe for these two long years.

But both hope and fear beckoned the Roumanians—the hope of a greater Roumania and the fear of a strangled homeland.

The brave people of this little kingdom—for it is less than one-fifth as big as Texas—have many proverbs. "The water passeth and the stones remain," they say, referring to their own persistence as a people in spite of the floods of humanity that have swept over their territory. And again, "Water draws to its current and the Roumanian to his race," a statement to illustrate the cohesiveness and national spirit of the people.

A WHIRLPOOL OF RACIAL RIVALRIES

In the whirlpool of racial rivalries of southeastern Europe—where Roman and Goth, Hun and Slav, Magyar and Mongol, with all of their descendant peoples, have run over one another and been run over in their turn—fate left the Roumanians in the majority in a territory of more than 90,000 square miles. It scattered more than 12,000,000 of them over these lands—more than 7,000,000 in Roumania itself and some 5,000,000 elsewhere (see "Map of Europe," 28 x 30 inches, in four colors, published in the July, 1915, number of the GEOGRAPHIC MAGAZINE).

In Bessarabia, a province of 17,000 square miles and 2,600,000 population, belonging to Russia, two-thirds of the people are Roumanian; in Transylvania, the eastern part of Hungary, a land of 21,000 square miles and having a population of 2,500,000, 60 per cent, Roumania claims, are Roumanians; in Bukowina, an Austrian crownland of 4,000 square miles and 1,000,000 population, more than half are said to be Roumanians (see also pages 201 and 202).

And so 12,000,000 people yearn for a "restored" Roumania — all ethnographic Roumania under the flag of political Roumania. If their country remained neutral, they reasoned, there would be no chance of such a happy result. They might, they felt, get something out of Russia if the Central Powers won with Roumania on their side; but Transylvania and Bukowina would still be beyond their grasp.

On the other hand, they believed Russia would give them Bessarabia as a prize for participation on her side, and the Allies Bukowina and Transylvania on condition of an allied victory.

*See also "Roumania, the Pivotal State," by James Howard Gore, October, 1915; "Roumania and Her Ambitions," by Frederick Moore, October, 1913; "The Changing Map in the Balkans," by Frederick Moore, February, 1913, in the NATIONAL GEOGRAPHIC MAGAZINE.



Photograph by Erdelyi

TYPICAL ROUMANIAN COSTUMES OF THE CARPATHIAN AND EASTERN ALPS REGIONS

The Wallachian peasant who has not adopted the homely clothes that come from the ready-to-wear factories of western Europe is a picturesquely dressed man. His costume is white. The trousers are something like twice the length of the leg and are made to fit with numerous wrinkles; his shirt is made to hang tunic-like over his trousers and is gathered at the waist with a red belt; his coat is a sort of military cape, usually of brown woolens or of tanned sheepskin.

LED BY HOPE, IMPELLED BY FEAR

But if hope of a "reunited" Roumania appealed greatly to the Roumanian, the fear of strangulation, if not extinction, turned the scales positively to the cause of the Allies.

To show what this fear was and how it impressed the people of Roumania, I can do no better than to quote from a booklet issued from the Oxford University Press, whose author is D. Mitrany, a Roumanian advocating intervention. He says:

"But if the Allies win, the Austro-Hungarian monarchy will no doubt be dismembered, and Roumania will find herself in the not very enviable position of being tenderly squashed between the palm of the Slav and the fingers of the Magyar.

"But, further than this, one of the chief aims of Russian policy has always been the possession of the Dardanelles. Russia never was as near to its realization as she is now, when the Turkish Empire is a thing of the past and when she has England as an ally—England, who has always barred her way to the Golden Horn.

"Russia in Constantinople, however, means the strangulation of Roumania. Bulgaria has an outlet on the Ægean, Serbia will no doubt have one to the Adriatic, but Roumania depends entirely upon the Dardanelles. Her splendid position at the mouth of the Danube, her possessions on the Black Sea, will be of little worth with the mighty Empire of the Tsar dominating the Black Sea, the Sea of Marmora, and the Straits. Not only is the cheap waterway an absolute necessity for the bulky products—corn,



Photograph by Frederick Moore

A ROUMANIAN GIRL COMING FROM MARKET



MARKET-PLACE IN A ROUMANIAN TOWN

There are a million small farmers in Roumania and only a few thousand large ones; but the few big landowners have more land than the many small ones. The average size of the million small farms is 8 acres, while that of the 4,471 large ones is 2,200 acres. With so many small farms, naturally a prolific farming population has little money to buy machinery and must be content with the ways and methods of past generations.

petroleum, and timber—which form the chief exports of Roumania, but these also form the chief exports of Russia, who, by the stroke of the pen, may rule Roumania completely out of competition."

FIFTY PEASANTS CAST ONE VOTE

Let us turn from her choice and the trials its making involved and go about among the people, in the hope that we may learn something of their ways, their viewpoint, their relationships, their history.

Roumania proper is a country of 53,000 square miles, with a population, as stated before, of less than 8,000,000. It is thus slightly larger than Pennsylvania, although it has half a million fewer people than the Keystone State.

The country today is governed by a king, who is a constitutional monarch, and a parliament made up of a Senate and a Chamber of Deputies. The Senate has 120 members, who are elected for eight years. No man with an income of less than $1,880 a year can be a senator. The Chamber of Deputies has a membership of 183, and the term of a deputy is four years. The masses can vote for deputies indirectly, but not even indirectly for senators. It takes fifty manhood-suffrage votes to offset one property-owner's or educated-man's vote. The men who get their right to vote on the basis of manhood suffrage and not on the basis of wealth or education simply vote for a man to cast their vote for deputy, and it takes fifty of them to have one vote cast in their behalf.

The electorate is divided into three classes, the value of their respective votes being dependent on the status of the individuals entitled to vote in the several classes. The manhood-suffrage contingent above referred to constitutes the third class. Railroad passes are given by law to all government officials, including both senators and deputies.

SURPASSES ALL HER BALKAN NEIGHBORS

Military service is compulsory, and usually every boy has to spend two or three years with the colors upon reaching his majority, after which he goes into



Photograph by Erdelyi

WALLACHIAN MARKET FOLK

In the old days of the United States, before the advent of the mower and the reaper, the mountain folk came down into the valleys in the planting and reaping seasons. The Wallachians, to this day, in times of peace go into Hungary by the tens of thousands to help with the sowing and reaping.

the occasionally maneuvered reserve. During times of peace the ranks were filled in many localities by drawing lots, for army discipline was trying to them after the free and easy life of the peasant home, and the young men seldom liked to serve.

In normal times the receipts and expenditures of the government amounted to approximately $120,000,000, or one-eighth as much as our own. The king receives half a million dollars a year, and the heir to the throne $60,000.

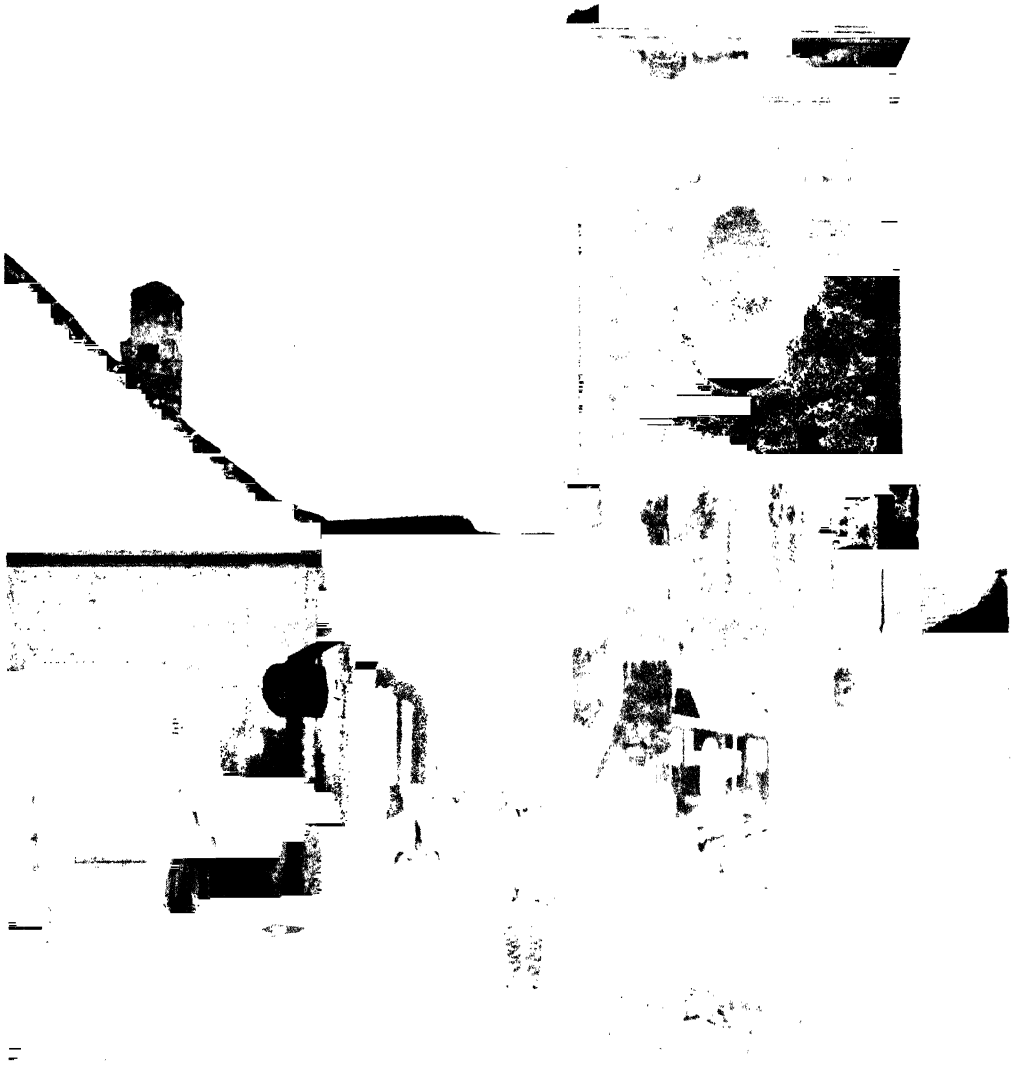
ROUMANIA COMPARED TO HER NEIGHBORS

One may get a good idea of the relative standing of Roumania and her Balkan neighbors from a few statistical comparisons. She has a population of 141 per square mile, as compared with Serbia's 137, Greece's 94, and Bulgaria's 108. Her imports amount to $15 per capita, as compared to Serbia's $7.50, Greece's $7.80, and Bulgaria's $8.75. Her exports per capita amount to $18.42, as compared with $7.63 in the case of Serbia, $7.21 in the case of Greece, and $7.87 in the case of Bulgaria. She also spends approximately one and a half times as much per capita for governmental purposes as Greece, Serbia, or Bulgaria in normal times.

Industrially the country is almost entirely given over to agriculture, and, area for area, it produces more cereals than any other great grain-producing nation in the world. Its farm lands are about equally divided between the small farmer and the rich land-owner. There are about a million farms with an average size of eight acres, and then there are 4,471 estates with an average size of 2,200 acres.

The result is that one finds the strangest contrasts in farming methods. Here is a big estate, where every sort of farm machinery that the United States has to offer is to be found — the binder, the mower, the steam gang plow, the riding cultivator, the manure spreader, and even the steam header and thresher. And then hard by are a hundred small farmers who still harvest their grain with the sickle, thresh it with the flail, or tread it out with oxen and winnow it with the home-made fork. They mow their grass with the scythe, rake it with the hand rake, and haul it in with ox-carts.

But even with the very primitive methods that characterize half of the



Photograph by Erdelyi

AN ANCIENT GATEWAY TOWER IN TRANSYLVANIA, HUNGARY

This picturesque old town, Medgyes, has walls and bastions and churches that are survivals of the days of medieval Europe. It lies in Transylvania, that part of Hungary which the irredentists want to bring under the Roumanian flag.

farming of the country, they manage to coax a rather bountiful crop out of the soil. They produced 89,000,000 bushels of wheat last year, an average of nearly twenty bushels to the acre—a yield almost a third greater than our own. Their corn crop amounted to 110,000,000 bushels, or nearly twenty-two to the acre. They also had a 29,000,000-bushel crop of barley and an oat crop of similar proportions.

The year before, 1914, they experienced the throes of a crop failure, the wheat yield being cut in half and other cereal crops being sadly below normal.

In normal years they have a big surplus, with about 40,000,000 bushels of corn, 50,000,000 bushels of wheat, and 11,000,000 bushels of barley to throw into the world's markets. Heretofore, since the outbreak of the war, the Central Empires had been able to buy the bulk of this surplus, and the blow of Roumania's participation in the war will probably be as heavy from an economic as from a military standpoint.

PECULIAR CUSTOMS, STRANGE SUPERSTITIONS

The great bulk of Roumania's population belongs to the peasant class, for there are comparatively few cities and most of them are small. Many of these peasants live on the great estates, where their forebears for generations have farmed for the absentee landlords.

An interesting class these peasants form, with their peculiar customs, their striking superstitions, their primitive ways of looking at things in general.

The evil of race suicide has never invaded rural Roumania. It is regarded as worthy of honor to be the head of a numerous family. As in all lands where many of the people are more or less illiterate, there is a high death rate, though the fact that the bottle-fed baby is almost unknown in peasant Roumania tends to overcome the high infant mortality that would otherwise result.

That they are a fecund folk is revealed by the fact that, although their death rate is high, they still have an annual excess of 118,000 births over deaths. Apply that same ratio of increase to the American people, and without a single immigrant we would grow at the rate of more than a million and a half a year—fifteen million or more between census years. Yet, even with our enormous immigration, between 1904 and 1913, inclusive, we grew only a little more than 14,000,000.

The average Roumanian peasant is not given to the kind of thrift that leads him often to a savings bank. The patrimony of his sons and daughters is more often good will, good health, and an honest mind than it is land, or money, or houses. So narrow is the margin upon which a young couple starts out in life that it has come to be a proverb among them, "Married today and out at the elbows tomorrow." For children come apace, and the prices of the things the peasant has to sell are even lower than the prices of those he has to buy, and not until his own labors are supplemented by those of sons and daughters has he much chance to prepare for even the shortest of rainy days.

When a young Roumanian peasant lad's thoughts turn to love and his mind begins to incline toward marriage, he goes to his mother rather than to his sweetheart with his tale. He tells her all about it, but rarely thinks of confiding the happy secret to his father; for Roumanian peasant fathers have faced the stern realities of life so long that they are apt to forget that they were once boys, and therefore have little sympathy with love-lorn tales.

IF THE FIRE BURNS, LOVE TRIUMPHS

But the mother acts as ambassador to the father, and if he can be induced to look with favor upon the lover's choice, he calls in two of his best friends in the village, tells them of the son's dreams, and asks them to accompany the said son to the house of the object of love's young dream. Mayhap the girl herself has not yet received from the youth a single hint of his love; but even so, as he and his spokesmen approach the house she suspects the object of his visit and peeps through any crack or cranny that is convenient.

If it happens to be winter, the father of the girl invites the company in, and, surmising their mission, gives some hint as to his attitude by the way he looks after the fire. If he keeps it burning

brightly, they know he is favorable. If he lets it die down a little, they understand he is only of an open mind on the subject. But if he lets it go out entirely, there is no use arguing the question.

It usually happens that the father of the girl is of an open mind, and the boy's spokesmen tell what a fine, husky young fellow he is, what a good brother he is to his sisters, what a good son to his mother, what his patrimony is, how industrious he is, etc.

THE NATIONAL DANCE

The Roumanian peasants have a saying that they must dance on Sunday to keep the creak out of their bones on Monday. Most of the dances are at the public houses — dance halls under the blue sky, as it were—and young and old gather there. The old folk spend the day with the tipple, while the young ones dance. There is very little drinking on any other day of the week, and a tipsy man except on Sunday is seldom seen.

The national dance is a sort of cross between a jig and the game of ring-around-the-rosie. All the dancers clasp hands and form a ring. They then begin a stepping, swaying motion that never moves them out of their original tracks, and to the music of the Tzigana band they keep it up for hours.

The dances are organized by the boys of the community. They arrange for the music, provide the refreshments, and preside as masters of ceremonies. When the girls reach a marriageable age and have been sufficiently instructed in the household arts, they are allowed to attend these dances as participants. "She dances at the dance" is the peasant way of saying that a girl has made her debut and is eligible for matrimonial attentions.

"Many hands make light work" is another proverb of the Roumanian peasant, often put into practice. Almost every night there is a neighborhood gathering like the old-fashioned apple-cutting or apple-butter boiling in early American rural history. The houses have their turns at these parties, and there is always a kettle of cornmeal mush and baked pumpkin and potatoes and popcorn ready for the occasion. All hands join in the evening program of combing, carding, and spinning the household supply of wool or flax, the while neighborhood gossip passes current among the elders and occasional words of love or childish jest among the more youthful members of the party.

One-third of the area of the country toward the north and west is inhabited by semi-civilized shepherds. Up in the Carpathians in summer and down in the sheltered valleys in winter they lead their flocks, sleeping in the open with them and despising any other shelter than that which primitive nature and the starry sky afford. They seldom speak; indeed, their solitary lives leave them little opportunity for conversation. They wear their hair and beards long, and have coarse, white woollen shirts and long mantles of wool-covered sheepskin.

SIGNS AND PORTENTS GOVERN PEASANT LIFE

The Roumanian peasant is much given to superstition, and he has a sign for everything. If shingles are not nailed on a roof in the proper sign, they will turn up at the ends; if potatoes are not planted in the proper sign, they will grow on top of the soil and be a failure; if you have money in your pocket when you see the new moon, you will not "go broke," at least not until another new moon comes. On the other hand, it is held to be dangerous to announce to those in the house that the new moon has appeared, for in that case all the pots and pans in the kitchen will be broken before the waning moon passes.

When a peasant child is christened, all of those present assume the relation of god-parents, and it is a superstition that there must be no intermarriages between god-fathers and god-mothers. The result is that christenings are not widely attended, and those with matrimonial ambitions eschew them entirely.

The utmost care is taken by some to prevent a child from seeing its image in a mirror before it is three years old, for if it does it will become a victim of the "falling sickness," which will send it stumbling through life.

The girls of Roumanian country districts take great pride in a clear, healthy



Photograph by Erdelyi

A WALLACHIAN FAMILY: TRANSYLVANIA, HUNGARY

These are Roumanians whose ancestors crossed the Transylvanian Alps out of Wallachia and into Transylvania. The longing of Roumania to unite under her flag all her people—Wallach and Moldave alike—whether they dwell north of the eastern Alps or east of the Pruth, was one of the influences that led her to enter the raging torrent of war that has all but engulfed the continent of Europe.



Photograph by Erdelyi

A ROUMANIAN WOMAN AT GAVOSDIA

The peasant woman usually grows some silk. She buys the silk-worm eggs and uses the spare bed, if there be one in the house, as a hatchery. She feeds the worms on mulberry leaves, and, if the ants do not invade the place and destroy the worms, she soon has enough fiber for a veil or a waist. She spins and weaves it herself.

complexion. And just as the girls in our own rural districts a generation ago would get up before breakfast and steal down unobserved on the first day of May to wash their freckles away in the dew of the morning, so the girls of Roumania take red and white threads, twist them into cords, from which they suspend coins around their necks. These talismans they wear from the dead of winter to the moment they see the first blossom of spring, feeling sure that thereby they will guarantee themselves a milk-white complexion, rosy cheeks, and ruby lips.

BUCHAREST—THE GAY CAPITAL

But if there is primitive simplicity in Roumanian peasant life, there is ultra formality in the polite circles of Bucharest, the national capital. "The Paris of the East" its inhabitants proudly call their city, and in the character of its architecture, the ways of its people, the prices in force at its hotels, it justly deserves the title it has vauntingly assumed.

This near-eastern metropolis is about equal in size to our own National Capital, and yet it has twenty times as many restaurants and cafés, ten times as many street lights, and twice as many theaters. It is regarded as the most expensive place in the world for the well-to-do and the cheapest for the poor. Prices at the Hotel du Boulevard are higher than in New York or London, and travelers who have visited Monte Carlo's leading hotels and then journeyed to Bucharest have found its rates from 15 per cent to 25 per cent higher than those obtaining in the hostelries of Monaco.

But if their prices are high, their service and their food leave nothing to be desired. The cuisine of the leading hotels and private homes is French, and money is no consideration—quality is paramount. Some of the finest restaurants east of Paris are in Bucharest, and the night life, with its passionate, pulsating gypsy music, its sparkling wine, its beautiful women, its scintillating jewels, its handsome men, is as gay and alluring as anything the world has to offer.

As to clothes, everybody who pretends to dress at all dresses in the mode of Paris, and the gowns of the élite are as up-to-the-minute as those to be seen on the Champs Elysees.

Gambling flourishes openly, and high stakes are the rule rather than the exception. Many of the players own farms as big as an American county, and their incomes are proportionately large.

RUSSIAN EXILES AS STRANGE "CABBIES"

The source of the wealth of Bucharest is the big country estates and the cheap labor. The rich "boyar" has a whole army of retainers, who receive little more for their toil than did the slave in our own country before the Civil War—their "victuals and keep." The result is an immense income, which finds its first expression in a very fine residence in Bucharest, and later in the maintenance of an ultra-expensive establishment. It is said that the Roumanian Government has the finest home for its foreign ministry to be found in all Europe. It was built by one of these "boyars," or landed proprietors, who had the misfortune to die soon after his palatial home was completed. The government thereupon acquired it.

Nobody but the proletariat thinks of walking in that picturesque capital. Nearly all of the "cabbies" own their own teams of long-maned, flowing-tailed Russian horses. They are Russian exiles of the Skopti sect, who have a religious belief that no family should have more than one male child and who resort to a religio-surgical ceremony to insure this condition.

They wear great blue-black velvet coats, the skirts of which reach to the ground. Their waists are bound about with multihued sashes, the flowing ends of which drop back over the seat, and one can guide his driver by pulling one end or the other of this sash when language difficulties stand in the way.

If the presence of the landed aristocracy in Bucharest reminds one of Buenos Aires, the driving customs bring to mind those of Mexico City. Every evening all polite Bucharest turns out in its smartest equipages and drives up and down the beautiful parkway known as the "Chaussee." Along this superb drive the endless-chain procession moves in double



A MARKETING SCENE IN TRANSYLVANIA, HUNGARY

Photograph by Erdelyi

Banffy Hunyad lies in Transylvania, but its population is not Roumanian. It is the center of a rich district, "Kalotaszeg," which is a small land of Hungarian civilization in the sea of Wallachian Transylvania. The women are noted for their beauty and the men for their stalwart uild. The tight-fitting jackets of the women are a mass of harmonious colors, and their raven-black hair is bound in ribbons.

file, with the center of the boulevard reserved for the royal turnouts. There is no physical line of demarcation between this "king's highway" and the other part of the boulevard, but courtesy toward the royal family draws and respects an imaginary one.

PRINCE CHARLES THE MIRACLE-WORKER

But Roumania was not always thus. Forty years ago it was, both as to country and as to capital, one of the most backward nations of Europe; and then it called Prince Charles of Prussia to its throne. Although he had to travel to Bucharest *incognito* in order to escape the secret service of Austria, which was determined to keep him out, he immediately set to work to bring the country up to a higher standard, and the story of his reign, which closed with his death soon after the European war began, is largely the same sort of story of development as that of Germany during the reign of his Hohenzollern kinsman. King Carol, as he was called, had for his queen Elizabeth, a German princess, better known by her pen name of Carmen Sylva. She, too, was spared the sorrows of Roumania's hour of decision, having died a few months ago. They had one child, but it died in infancy, and Carmen Sylva turned her interest to the poor of the country and to letters and music. It is said that she was perhaps the most talented queen of her generation. She could converse in six languages; she wrote some thirty books; she composed an opera that was staged and praised on the continent, and her symphonies and songs have won a place in the world of music. Likewise she was no mean wielder of the brush, and was an expert needlewoman. Her pride was her work for the blind, for whom she founded an institution in Bucharest.

The present king is a nephew of King Carol. His wife is a granddaughter of Queen Victoria, and therefore a first cousin of most of the reigning heads of Europe.

Under the new era initiated and carried down to the present by the Hohenzollern dynasty, Roumania has gone far ahead of her neighbors of the Balkan region, and the visitor to Bucharest early finds that its people resent the idea of being classed with the Balkan States. They feel that they are the superiors of the Serbs, the Bulgars, the Montenegrins, and the modern Greeks, and that their country is superior, just as the people of A, B, C South America feel that their nations are not to be confounded with the remainder of Latin America.

CUSTOMS PERPETUATE HISTORY OF ROME'S GLORY

Let us now turn to Roumanian history and note some of the outstanding events that have been the crossroads on her highway from the past to the present. The early inhabitants were Dacians. Pliny and Herodotus agree that they were the bravest and most honorable of all the barbarian tribes that Rome encountered in her days of expansion. Thucydides praises them as wonderful fighters on horseback.

The Trajan Column in Rome bears the author's story of the great emperor's conquest of this territory. Across the Danube are the ruined piers which once supported a bridge built by Trajan, and some sections of the great military road he constructed still are in use as a part of the national highway system.

Also there are many customs which still proclaim the ancient rule and influence of Rome that have persisted through the centuries since the departure of her glory. For instance, there is the old Phyrric dance, the robes with bells on sleeves and girdles. The Roumanians still shout in unison to prevent Saturn from hearing the voice of the infant Jupiter; and even their oxen proclaim the "glory that was Rome" in their names, for here you may see Cæsar and Brutus as yoke-fellows, and there Cassius and Augustus.

But when Rome withdrew, what is now Roumania became the Belgium of a series of racial struggles between the East and the West, first this horde and then that overrunning the fertile valleys. Invasion became the normal condition of Roumanian territory, and the sturdy descendants of the early Romans and Romanized Dacians learned how to survive even such



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TSIGANY GYPSY WOMEN: ROUMANIA

There is perhaps no music in the world more passionately weird, ouching deeper chords of pathos, or reaching higher pitches of joy han that of the Tsigany folk of southeastern Europe. It has made hem famous wherever the lovers of the weird and the exhilarating



Photograph by Frederick Moore

ROUMANIAN GIRLS MAKING THREAD

The Roumanian peasant woman has a keen appreciation of the color values and combinations. She embroiders her dresses with thread she has grown from the seed—so to speak—for she plants the flax, gathers the fiber, and carries it through all its processes, from breaking and cording to spinning

conditions. When the waves of invasion swept over their valleys they simply retired to the mountains and waited for them to recede; nor did they wait in vain. The water of invading humanity in very deed did pass, and the stones of persisting Roumanian life did remain; and, although for many a weary generation their problem was to save themselves from extinction, they survived.

Today Roumanians are proudest of their Latin descent; so proud, indeed, that although their religion is Greek, and although there are more than 6,000 centers of Eastern influence, in the shape of Orthodox churches with Orthodox priests, they are drawn toward ancient Rome and not toward historic Greece.

THE SHUTTLECOCK OF NATIONS

For a thousand years the country was the shuttlecock in the game of political battledore and shuttlecock staged by the rival sovereigns of Europe—Russia, Poland, Hungary, Austria, Turkey, etc. Once Peter the Great established a protectorate over the Roumanians. Then came Catherine the Great with a plan to annex them to Russia. Austria, afraid that such a course meant Russian territorial expansion in a direction that threatened her, objected so vehemently that Catherine reconsidered, and Moldavia and Wallachia were placed, in 1774, under the suzerainty of Turkey.

In 1861 the two principalities decided to unite under the name of Roumania, in accordance with an agreement reached by the Powers, following the Crimean War. Their autonomy guaranteed, the Roumanians selected an army officer, Col. Alexander Cuza, as their prince, who thereupon came into power under the title of Alexander John I, Prince of Roumania.

In 1866 the ruling element in Bucharest decided that they wanted a change, so they politely invaded the prince's bedroom one night, gave him a certificate of abdication to sign, and announced that there was a carriage waiting which would convey him to the station, where he was to take the night express to Paris. He obeyed and disappeared forever from public gaze.

Thereafter a provisional government elected the Count of Flanders, brother to the late King Leopold of Belgium. But Austria and other powers protested so vigorously that the act was reconsidered and Prince Charles called, as previously stated.

ROBBED OF SPOILS OF VICTORY

When Carol assumed the throne, it became one of his principal aims to free his country from the suzerainty of Turkey. When the conflict between Russia and Turkey was impendnig in 1875, he first attempted to have the Powers guarantee the neutrality of Roumania during the war; but they were too busy with their own affairs and his efforts failed.

Then Roumania decided to enter an agreement with Russia. This agreement, which is illuminating, in the light of present-day history, granted free passage of Russian troops over Roumanian soil, Russia undertaking to respect the political rights and to defend the integrity of Roumania.

One of the first acts of Roumania after hostilities began was to declare her independence of Turkey. As the war proceeded, Russia found herself in sore need of help. Repeated appeals finally brought Roumanian participation, and Prince Carol was given the supreme command of the allied forces before Plevna, where he gained a great but costly victory.

When the war ended and Turkey and Russia entered into the Treaty of San Stefano, it did recognize Roumanian independence, although Roumania was not admitted to the peace conference. But it also provided that Roumania should get the swampy country between the Danube, where it flows north, and the Black Sea. On the other hand, Russia was to have Bessarabia, territory which Roumania claimed and a part of which she had occupied.

Roumania stood firm against the idea of giving up the beautiful Bessarabia in exchange for the unattractive Dobrudja. Russia thereupon threatened to disarm the Roumanian army, to which Prince Carol responded that Russia might destroy his army, but that it could not be disarmed.



Photograph by E. M. Newman

A VILLAGE STREET IN ROUMANIA

The day of "tap water" in every house in Roumanian cities is still a long time in the future, and such water-carriers as these are a common sight

The Congress of Berlin, which overturned the Russo-Turkish treaty of San Stefano, did not interfere with Russia's determination to force Roumania to accept Dobrudja in exchange for Bessarabia, and Roumania came out with less than she had when she went in. All she could do was to console herself with Lord Beaconsfield's remark to her, that "in politics the best services are often rewarded with ingratitude."

In 1881 the Roumanians decided that they were entitled to the rank of a full-fledged kingdom, and proclaimed their country the Kingdom of Roumania, crowning their sovereign king with a crown of steel made from cannon captured by their ruler himself in the bloody battle of Plevna.

Although any one who comes to study Roumania, her people, and their brave history will be almost certain to sympathize with the wrongs she has endured in years gone by, at the same time he will not escape the feeling that she, too, has contributed something to the injustices of history. Always bitterly resentful of ill-treatment toward any of her race by other countries, she has forgotten to show that charity toward others under her power that she asks for her people from other nations. Her treatment of the Jew has been almost as harsh as that patient race has experienced at the hand of any oppressor.

THE PERSECUTED BECOMES THE PERSECUTOR

It is hard to conceive in our own great land of liberty and equality how any nation could make such proscriptions against a race as Roumania has made against the Jew. No one is allowed to employ a Jew who does not also employ two Roumanians, and that means non-employment for the sons of Israel. Jews

are not allowed to be bankers, druggists, tobacconists; they have no standing in court, no right to employ counsel, no right to send their children to school except they pay for the privilege, which is free to all others. They cannot own farm land, are denied the right of holding government positions, and are prohibited from organizing or controlling stock companies or corporations. Furthermore, although some of them for forty generations have lived in Roumania, they are aliens still, under Roumanian law.

THE LAND OF HER DESIRE

When the Powers assented to the creation of Roumania, one of the terms of the agreement was that all of her subjects should stand equal before the law. But later Roumania decided that she would consider the Jew an alien, and so the agreement was nullified, with no hand raised in an effective protest.

The persecution, however, is economic rather than religious, for the experience of all eastern Europe has been that the Jew, under a free competition, manages to prosper where others barely exist, and so the attempt is made to handicap him as an equalizing process. Yet in spite of all his tribulations, in spite of governmental processes which would seem to leave nothing to the Jew but to emigrate, he manages to keep the noose from strangling him and to survive the fierce struggle.

While Roumania thus makes the Jew an alien, she does not regard him so when she needs men for her army. Then he is Roumanian from the crown of his head to the sole of his foot, although even in the army he cannot become an officer or escape the menial jobs that military operations always involve.

Having thus far considered the Roumania of today, let us now turn to the Roumanian lands of a possible tomorrow—Transylvania, Bessarabia, and Bukowina (see also pages 185 and 186).

Transylvania has a geographical rather than a political existence. It is a part of Hungary, although it is almost as much separated from geographical Hungary as the great plateau west of the Rockies is separated from the Mississippi Valley. It is the great highland region which forms the western slope of the Transylvanian Alps and the southern slope of the southeastern Carpathians. "The mountains cradled and brought our race to the manhood of its existence," say the Roumanians, and this applies both to the gradual western slope of the eastern Alps as well as to the sharper eastern slope.

In this territory one may find every form of scenic beauty from the idyllic pastoral picture to the majestically rugged mountain and the frenzy-churned waters of torrential rivers. The region's popular customs, language, and costumes are preserved in all their primitive originality, amid sharply defined boundaries created by nature and a sternly cold climate born of the high Alps.

A POTPOURRI OF PEOPLES

Those who travel through it look with bated breath upon the fabulous coloring of the bewitching pictures which water, rocks, forests, sheltered valleys, and white, glistening peaks, together with striking people, conspire to make. It is a veritable treasure-house of contrasting costumes: here those of the Wallachian, here those of the Moldavian, here those of the Saxon, here those of the Hungarian, and here all of them in a gay *potpourri*, with a sprinkling of Greek, Bulgar, and Serb, of Gypsy and of Slovak, thrown in. There are a million and a half Wallachians in Transylvania, 700,000 Hungarians, and 200,000 Saxons.

In the heart of Transylvania there is a district known as the Kalateszag, which has been strikingly described as a Hungarian island in the sea of Transylvanian Wallachia. Banffy-Hunyad is its center, and it is a place famed for its beautiful women. With their steely black hair, their rainbow-hued ribbons, their pearl fillets, and their tight-fitting, art-embroidered jackets, they present a picture that can never be forgotten.

There are many salt mines in Transylvania. The ones at Marosujvar produce a hundred million pounds of salt a year. In the one at Tordo there is a gallery known as the Joseph gallery, where one may hear his voice echoed and re-echoed sixteen times.

From the standpoint of material value, Bessarabia would be worth more to Roumania than Transylvania. It is one of the richest provinces of Russia, and, with the Pruth on the one side and the Dniester on the other, it is ideally watered, no place within its boundaries being more than forty miles from a navigable stream. With the exception of a few miles of its Bukowina boundary, it is entirely surrounded by water—the Dniester, the Pruth, the Danube, and the Black Sea. Kishinef, which is remembered with horror as the scene of the frightful Jewish massacre of a few years ago, is its capital.

The southeastern corner of Bessarabia lies only a dozen miles or so from the great Black Sea port of Odessa—the New York of southern Russia.

SURROUNDED BY VAST SLAVIC SEA

The climate is, on the whole, salubrious, and while the northern part is somewhat mountainous, through the presence of the outlying spurs of the southeastern Carpathians, the bulk of the territory lies in a rolling farming country that has produced marvelously, considering the poor farming methods practised, and is capable of great crop yields under modern conditions of cultivation. There is much of that rich black soil that has made Illinois, Iowa, and Kansas famous for their agriculture.

Bukowina is an Austrian crownland traversed by offshoots of the Carpathians, and famous for its horses and cattle. It has many fine forests, numerous rich mines, and its people have been thrifty and industrious. It has belonged to Austria for nearly a century and a half, having been ceded to that country by Turkey in 1777. It is populated by a veritable congress of races, with the Slav and the Roumanian well in the majority. Where once the effort was to Germanize the Roumanian, the encroachments of the Slav led Teuton and Roumanian to stand together against his powers of absorption.

Surrounded on every side by the Slavic Sea—the deep ocean of Russia, the bay of Serbia, and the gulf of Bulgaria—who can say whether in future centuries the attrition of the Slavic tide will wear away the Roumanian shore, or whether this present great war will fix political boundaries that will be as firm as the geographic boundaries themselves?

Remembering how she has been excluded from peace conferences in the past, how even her right to be heard in the Congress of Berlin was gainsaid, how she usually has lost in the field of diplomacy whatever she has won on the field of war, she probably has had an understanding this time that, in the event of an allied victory, will insure her the territorial expansion she craves and salvation from the strangulation she fears.

SALONIKI

By H. G. Dwight

"Saloniki is not a common city, but a country of the fortunate."—Eustathius, Bishop of Saloniki in the fourteenth century.

SALONIKI stands on rising ground at the head of a long gulf, shaped very much like what the classicists call a Phrygian cap, or what is perhaps more familiar to us as the liberty cap of the French Revolution. This gulf, bending to the east in such a way that its inner recesses can never feel the disturbances of the open sea, is formed by that peninsula of Chalcidice whose three long promontories of Kassandra, Longo, and Athos are the most salient feature of the northern Ægean (see map, page 271). The longer western shore of the gulf sweeps in a curve of over a hundred miles from Saloniki to the tip of the peninsula of Thessaly.

For the greater part of their course these spreading coasts are both high and admirable to look upon. But the line of the Greek mainland is in particular notable because above it tower the three classic peaks of Olympus (9,800 feet), Ossa or Kissavos, as it is now known (6,400 feet), and Pelion or Plessithi (5,300 feet).

STRATEGICALLY VALUABLE APPROACHES

The natural advantages of this inland sea are further increased by various points, indentations, and islands that divide it into four parts. The inmost section is the landlocked bay of Saloniki, a great oval harbor formed by the delta of the Vardar and the opposite cape of Karâ Bournóu. The span between the two is no more than 6 or 7 miles, and they lie 10 miles from Saloniki, making a lake-like basin of perfect security.

This complicated and beautiful disposition of mountains, capes, and islands makes the marine approaches of Saloniki of equal interest to the strategist, the geographer, or the mere admiring wanderer by sea. As regards approaches from the land, Saloniki is also happily placed.

NATURE DEFENDS THE CITY

The city faces west and south, toward Macedonia and Thessaly, looking out at Olympus through the gate of the inner bay. The immediate edges of the bay are flat, having been gradually leveled by the three rivers that pour into it. But at no great distance from the water the final spurs of the Rhodope Mountains make an amphitheater which rises east of the city into three peaks of 3,000 feet each (see map of Europe, 28 x 30 inches, published in the July, 1915, number of the National Geographic Magazine).

On the north the hill of Daóud Babá reaches a height of 1,500 feet, whence the ground drops away into the plain of the Vardar. This fertile depression, locally known as the *campania*, stretches inland and northward 40 or 45 miles to the buttresses of the Pindus range and the heights that separate western from central Macedonia.

These inclosing eminences are all in Greek territory. Through them strike five main avenues of exit, radiating toward every part of the Balkan Peninsula. The southernmost, the valley of the Vistritsa, the classic Heliakmon, is the main artery of communication between Saloniki, Thessaly, and Athens. No railroad, however, as yet connects the systems of northern and central Greece.

IMPORTANT RAILROAD OUTLETS

Next, to the southwest, opens the valley of the Mavronéri (Lydias), an affluent of the Vardar, which has always been a highway between the Ægean and the Adriatic. Through it runs the railway to Monastir, 120 miles distant.

A second and more important railroad follows the main stream of the Vardar



Photograph by F. Caloutas, Syra

KING CONSTANTINE AND EX-PREMIER VENIZELOS AT SALONIKI

(Axios), the chief river of Macedonia, leaving Greek territory near Gevgeli, some 40 miles to the northwest. At Üsküb, about 150 miles from Saloniki, it divides, one branch going to Mitrovitsa, on the confines of the old Sanjak of Novi Bazar, the other joining at Nish the main line of the Orient Railway.

This is the highroad between Greece and Europe proper, and was the route followed by the Austro-German armies on their advance into southern Servia. The streams flowing through these valleys, with their tributaries and the lakes which they feed, make the *campania* the granary of Saloniki. But as they converge toward the city and the gulf they form a region of swamps which is harmful or useful, according as one regards it from a hygienic or a strategic point of view.

A fourth and less practicable valley, that of the Gáliko, opens behind Saloniki to the north. Last, but not least, especially in the light of current events, is the long valley of Langátha (*th* hard), which separates the Chalcidice from the scarps of the Rhodope range. Starting a little to the north of the city, this depression runs due east to the Gulf of Órfana, or Rendina, lying between Kavala, the island of Thasos, and the outer shore of Athos.

THE SHORTEST ROUTE BETWEEN MACEDONIA AND THRACE

Two lakes make up 28 of the 40 miles from Saloniki to the sea, through the valley of Langatha. It forms the shortest and easiest route between Macedonia and Thrace. Through it of old ran the Roman road that went from Durazzo to Constantinople, by way of Elbasan, Ohrida, Monastir, and the valley of the Mavroneri. And long before the time of the Romans, Xerxes and his invading Persians streamed through the Langatha Valley on their way to Greece.

The modern railroad, however, takes a more roundabout route, winding among the foothills of the Rhodope, never very far from the Bulgarian border, through Seres and Drama to the Bulgarian port of Dedeagatch, 160 miles from Saloniki, and meets the main line of the Orient Railway near Demótika, in eastern Thrace.

It is not surprising that a city so admirably placed, whether for defense or for communication, enjoying the temperate climate of the northern Ægean, and amply provided with the various resources of field, wood, and water, should long have been known to men, and that its possession should often have been disputed.

SALONIKI MORE MODERN THAN ATHENS AND CONSTANTINOPLE

Yet compared to its two great neighbors, Athens and Constantinople, Saloniki is relatively a modern town. Founded originally as an Ionian colony, the place was first known as Therme, or Therma, from the hot springs which still exist in that eastern district of the bay. It fell into the hands of the Persians in 512 B. C., when Darius overran Scythia and Thrace; and Xerxes reassembled his own forces there preparatory to his invasion of Greece.

During the great days of the Macedonian Empire the city played no notable rôle, for Philip and Alexander the Great held their court at Pella, in the hills beyond the Vardar. The present town was founded about 315 B. C. by King Kassander of Macedon, and named after his wife Thessalonike, half sister to Alexander the Great. The adjoining peninsula of Kassandra takes its name from the king himself, who founded another city on its shore.

Under the Romans, Saloniki grew greatly in importance. Made a free city, the capital of the surrounding region, it became the home of many Roman colonists, and not a few famous names associate themselves with the town. Cicero lived there for a time in exile. St. Paul was another temporary resident, whose epistles to the Thessalonians we still preserve.

NERO BUILT A COLONNADE

The emperor Nero decorated the city with a colonnade, a few of whose battered caryatides were visible there until a few years ago, under the picturesque name of *las encantadas*—the Enchanted Women. They are now in the Louvre.

Trajan erected a rotunda in honor of the Cabiri; for they, with Aphrodite of the Baths, were patrons of pagan Saloniki. Galerius, one of the associates of Diocletian in the purple, made Saloniki his headquarters. Licinius, coemperor with Constantine the Great, died or was put to death there in 324 by his successful rival. Theodosius the Great also lived there, in 380, in order to keep his eye on the Goths.

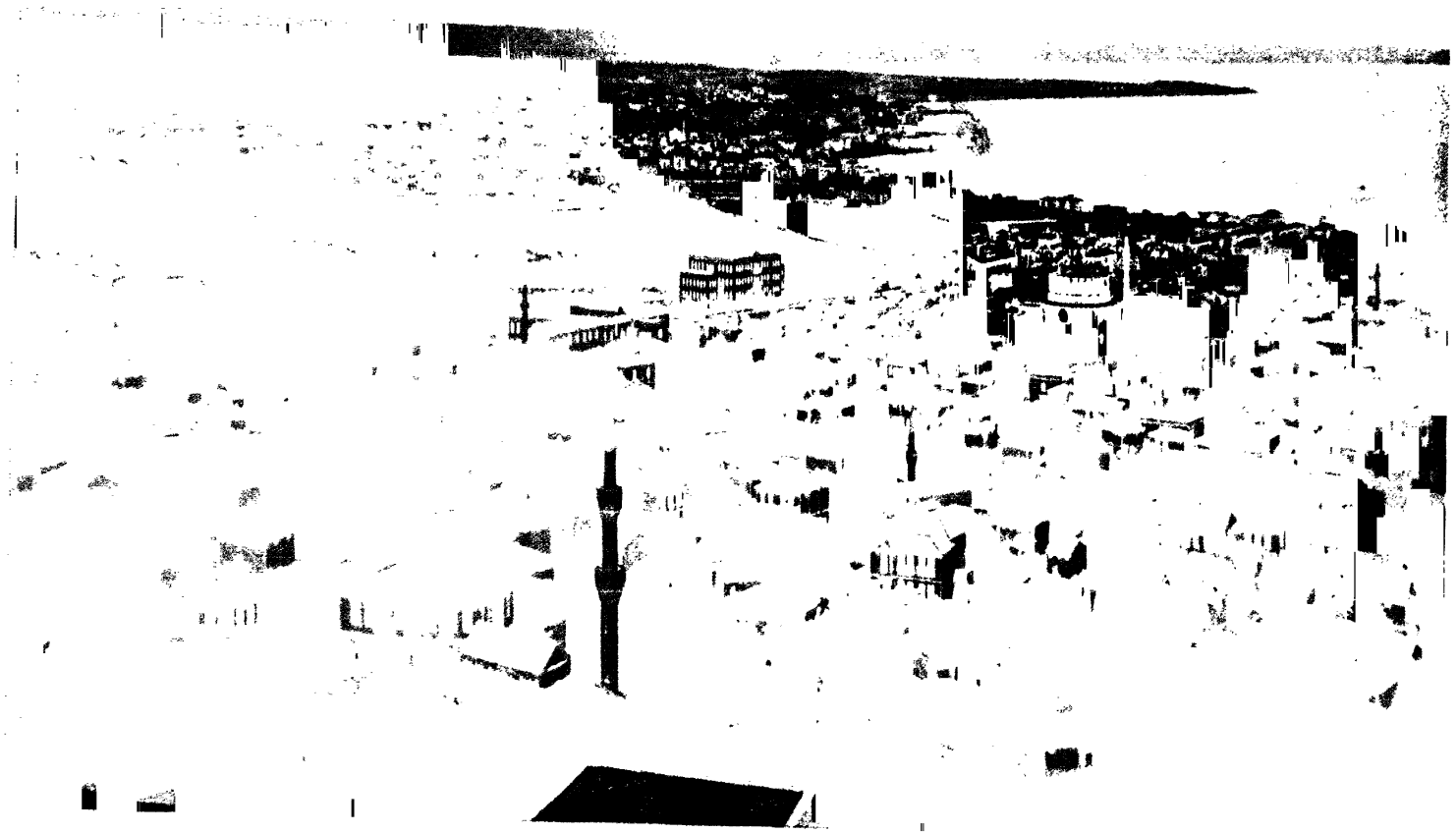
After his retirement to Milan, ten thousand of the Thessalonians were butchered in the circus, in punishment for insulting the emperor's lieutenant. St. Ambrose, Bishop of Milan, thundered from the pulpit against the imperial murderer, and Theodosius eventually made a most humiliating public penance.

During the Byzantine period Saloniki became the second city of the empire. Its situation made it the commercial capital of the Balkan Peninsula, and it rivalled Constantinople as a port of traffic between eastern Europe and Alexandria. But its wealth and its comparative remoteness also made it a frequent object of attack. Avars, Goths, and Huns came time and again to its gates. The Saracens captured and sacked it in 904. The Normans descended upon it in 1185.

SERB AND BULGAR VISITORS

And it is not uninteresting to recall that among the most assiduous of these redoubtable visitors were the Serbs, and especially the Bulgars. These neighbors owed much to Saloniki, from whom they took their faith and, indirectly, their alphabet; for it was from Saloniki that St. Cyril and St. Methodius went forth to convert and to civilize the hardy mountaineers of the Balkans. The hardy mountaineers, however, lost no opportunity to take more merchantable loot from Saloniki, though Saloniki itself they never took for long.

After the conquest of Constantinople in 1204 by the Franks and Venetians of the Fourth Crusade, Saloniki fell to the lot of Boniface, Marquis of Montferrat, who made it the capital of an imaginary kingdom. In 1222 King Demetrius, son of Boniface, was driven out with his Lombard nobles by a Byzantine prince of Epirus.



A VIEW OF SALONIKI, THE ALLIED BASE ON THE BALKAN FRONT

Saloniki is a city of about 140,000 population, nearly half of them Sephardic Jews, whose ancestors were driven from Spain and Portugal many centuries ago. In the right background is the White Tower, built by Suleiman the Magnificent (see also page 210)



© Underwood & Underwood

A STACK OF JAM FOR THE ARMY AT SALONIKI

The ensuing two hundred years were the most unhappy in the troubled history of the Thessalonians, who were fought over and bandied about by Greeks, Bulgars, Serbs, Catalans, Venetians, and Turks.

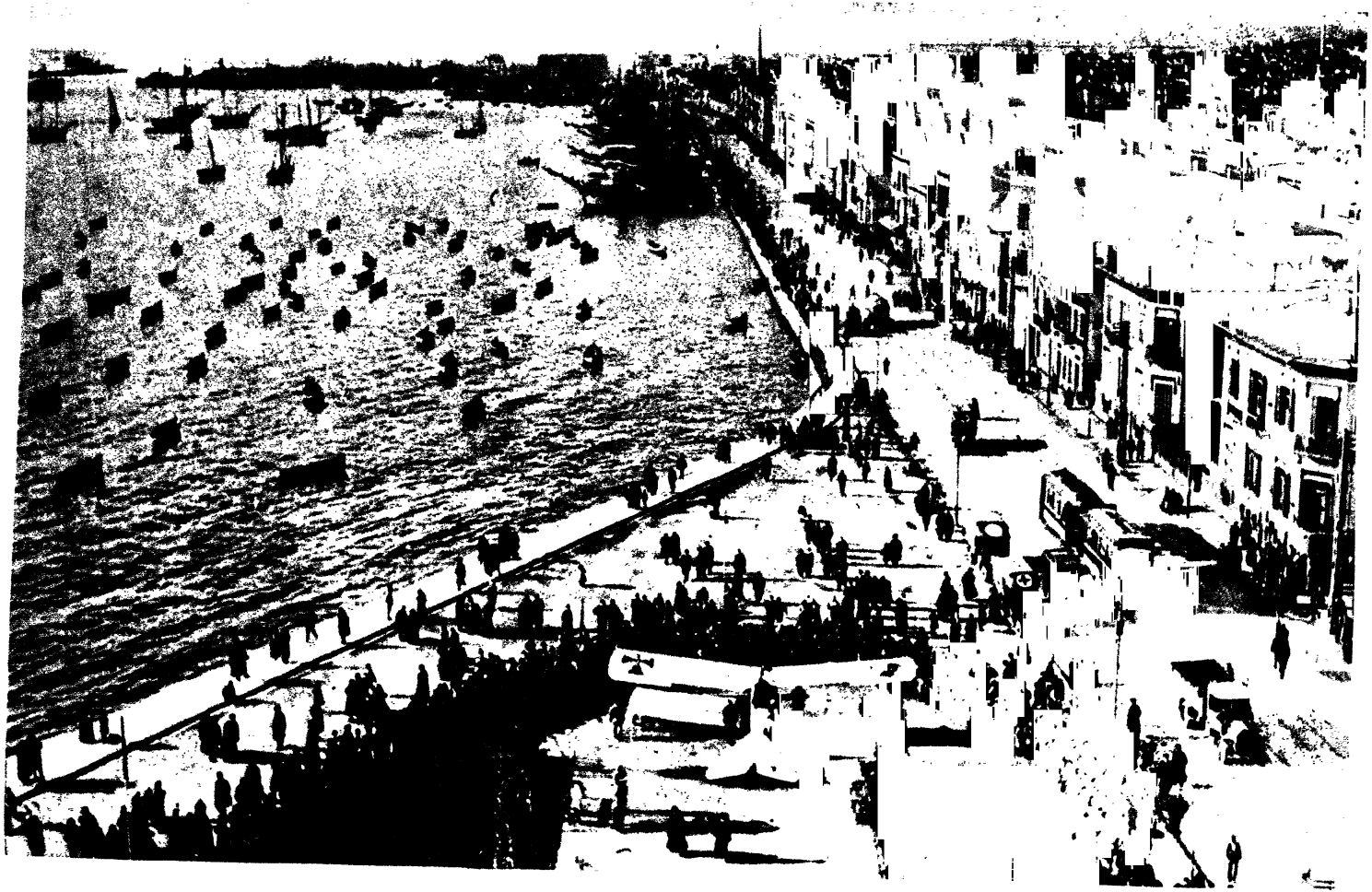
The latter first appeared on the scene in 1380. They did not definitely take possession, however, till 1430. Then Sultan Mourad II, father of the conqueror of Constantinople, captured the town from the Venetians, gave it over to sack and massacre, carried off seven thousand of the inhabitants into slavery, and changed many of the churches into mosques or tore them down for use in his own constructions. Some of the marbles of Saloniki were carried as far away as Adrianople.

UNDER TURKISH RULE FOR 500 YEARS

For nearly five hundred years the Turks remained in undisturbed possession. Yet it is perhaps not quite accurate to describe their possession as undisturbed; for during the latter part of that period the frontiers of the empire drew steadily nearer, while toward the end of it Macedonia became the scene of incessant revolutionary outbreaks.

In 1904 the European Powers attempted to solve the situation by making Saloniki the seat of an international board that administered the finances of Macedonia and organized a well-drilled and well-equipped gendarmerie. This foreign surveillance, which threatened to become closer after the historic Reval conference of 1908, precipitated the Turkish revolution of the same year.

The revolution was organized in Saloniki and proclaimed there, the official ring-leaders of the movement being Nyazi Bey and Enver Bey, now Enver Pasha, Minister of War and guiding spirit of the Young Turks. In 1909 the progress of the revolution brought about the dethronement of Sultan Abd-ül-Hamid II, who was thereupon exiled to Saloniki. Nowhere else in the empire



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THE RIVER FRONT OF SALONIKI

In the foreground is a German "aviatik," brought down by French air scouts during one of the recent air raids by the Germans



Photograph from Brown Brothers

SEA WASHING OVER INTO THE MAIN STREET OF SALONIKI

Barrels from lighters washed ashore. Traffic suspended.

would it have been more difficult for him to corrupt his keepers or to escape, and he spent three and a half years as a prisoner in the suburb of Kalamaria.

REMOVING THE EX-SULTAN

The outbreak of the Balkan War, in the autumn of 1912, made it advisable for the ex-sultan to be removed to Constantinople. He was most unwilling to return, however, and was only persuaded to do so by an emissary of the German ambassador, who took him through the Greek blockade in the dispatch boat of the embassy.

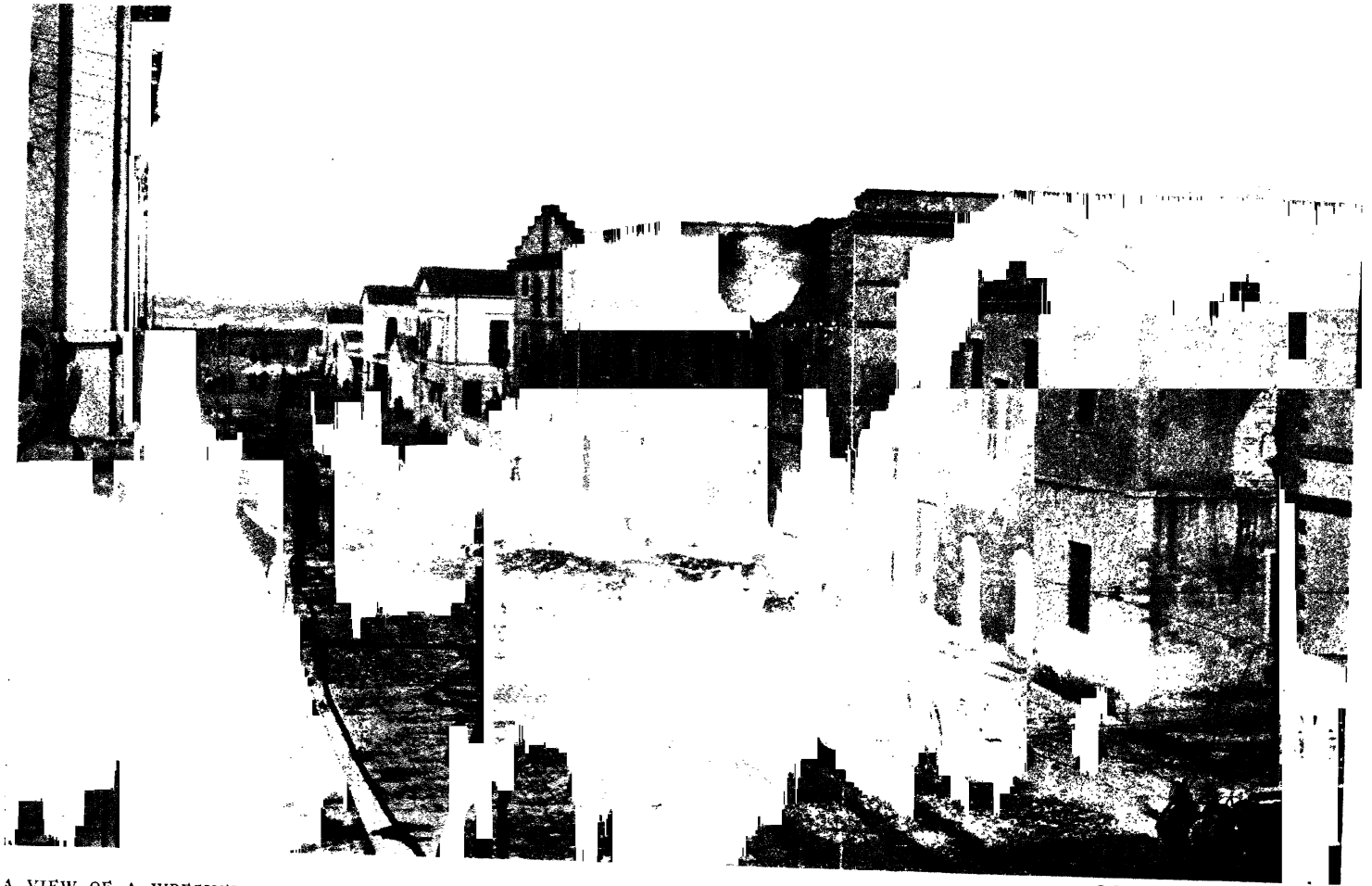
A few weeks later the Greek army entered the city, followed closely by a smaller detachment of Bulgarians. The final treaty of peace, signed at Bucharest in 1913, adjudicated Saloniki, with the remainder of the Chalcidice and their strategic hinterland, to Greece. But it is apparently written that Saloniki shall never long enjoy the blessings of peace. At all events, an army of the Allies, as we know, is now entrenched there. And he is a bolder prophet than I who will foretell what may yet lie in store for the people of Saloniki.

There is another aspect of Saloniki which is scarcely less involved in darkness and controversy, but which leads us away from too dangerous ground and offers a perhaps welcome escape from the harassing questions of the present. It is not surprising that so venerable a city should contain most interesting relics of its past. What is more surprising is that these should be so little known to the world at large.

AMERICAN STREET-CARS PASS UNDER ROMAN ARCHES

The oldest and most accessible of the antiquities of Saloniki is the long Street of the Vardar, slitting the town in two at the foot of the hill. This street is a segment of the old Roman highway from the Adriatic to the Bosphorus, which earlier still was the Royal Way of the Macedonian kings (see page 213).

The street is not particularly imposing,



A VIEW OF A WRECKED BANK, SHOWING THE SHORT DISTANCE BY WHICH THE AVI TOR'S BOMB MISSED THE BUILDING AT THE IMMEDIATE LEFT, USED BY THE FRENCH AND SERVIANS AS THEIR HEADQUARTERS: SALONIKI

The Servian national monogram is shown on this side of the atter building

© International Film Service



Photograph by Paul Thompson

GREEK CATHOLIC PRIESTS, FRENCH AND SERVIAN OFFICERS, AND MACEDONIAN CITIZENS IN COSMOPOLITAN SALONIKI

and as you watch the khaki soldiers kick up its dust today, there is little to remind you of the Janissaries of yesterday, the cohorts of Belisarius, the Roman legions, the phalanxes of Alexander, or Xerxes and his Immortals. Still, you may play fancifully enough with the centuries, as American electric cars, driven by a modern Greek, a Spanish Jew, or haply some stranded Turk, clang back and forth under the Roman arch that spans the Street of the Vardar near its eastern end.

The bas-reliefs about the bases of this arch are so blurred that archæologists long disagreed as to its precise date. But a train of camels distinguishable among them and the name of the river Tigris have sufficed to identify the monument as a triumphal arch of Galerius. In A. D. 296 Diocletian ordered him from the Danube to the Tigris to meet the invading Persians (see page 214).

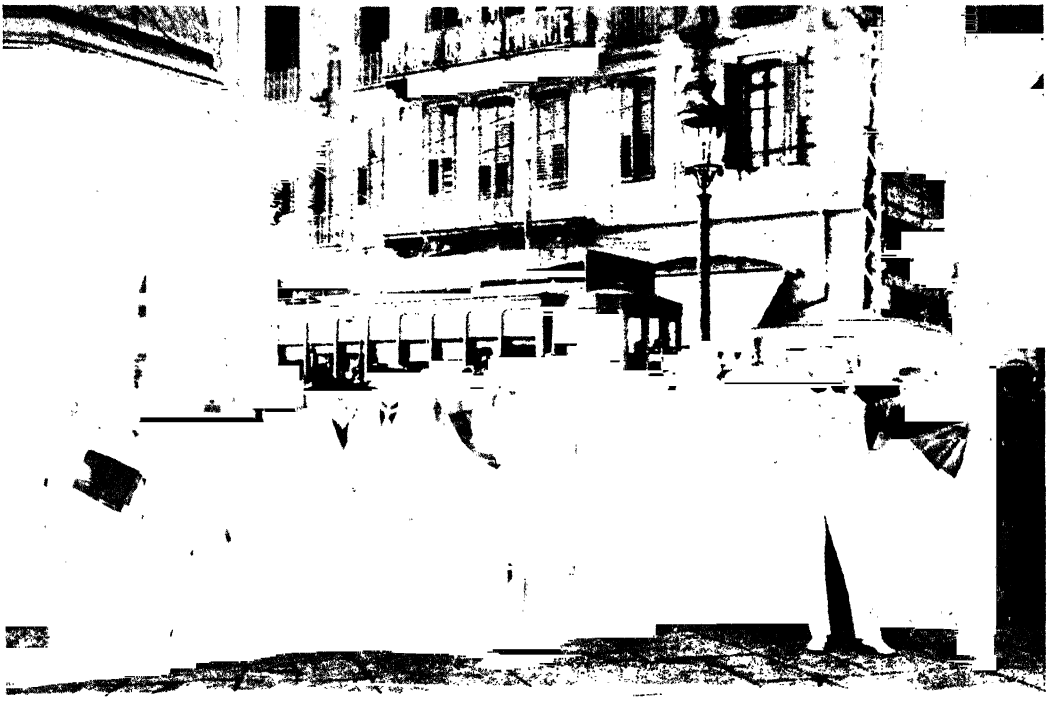
Galerius was beaten and only saved his own life by swimming the Euphrates. But the next year he returned to Mesopotamia and wiped out his disgrace by destroying the army of the Persian king.

The walls of Saloniki were long a more visible memento of her past. During the last generation, however, they have gradually been disappearing. The sea wall was naturally the first to go, followed by the lower part of the land wall on both sides. Sultan Abd-ül-Hamid II caused a modern boulevard to be laid out on the site of the old fortifications to the east, where the city has overflowed into the suburb of Kalamaria, little suspecting that he would ever live to see his handiwork or hear it renamed after that strange beast, the Constitution.

THE WHITE TOWER

He was wise enough to spare the great round tower at the angle of the two walls, which is the chief ornament of the water front. The White Tower, surrounded by a smaller crenellated wall of its own and four bartizan turrets, is comparatively modern, being the work of Süleïman the Magnificent (see page 219).

But the greater part of these old de-



Photograph by Paul Thompson

A SALONIKI CROWD GATHER TO SEE THE FRENCH MINISTER AT ATHENS LEAVE A CONFERENCE

The English hotel, the American street-car, and the French automobile proclaim the influence of the Modern West in the New East

fenses date from the fourth century of our era, when Theodosius the Great took pains that Saloniki should not suffer the fate of Adrianople at the hands of the Goths. The walls of Saloniki are thus older than the more famous walls of Constantinople, which were built by the grandson of Theodosius.

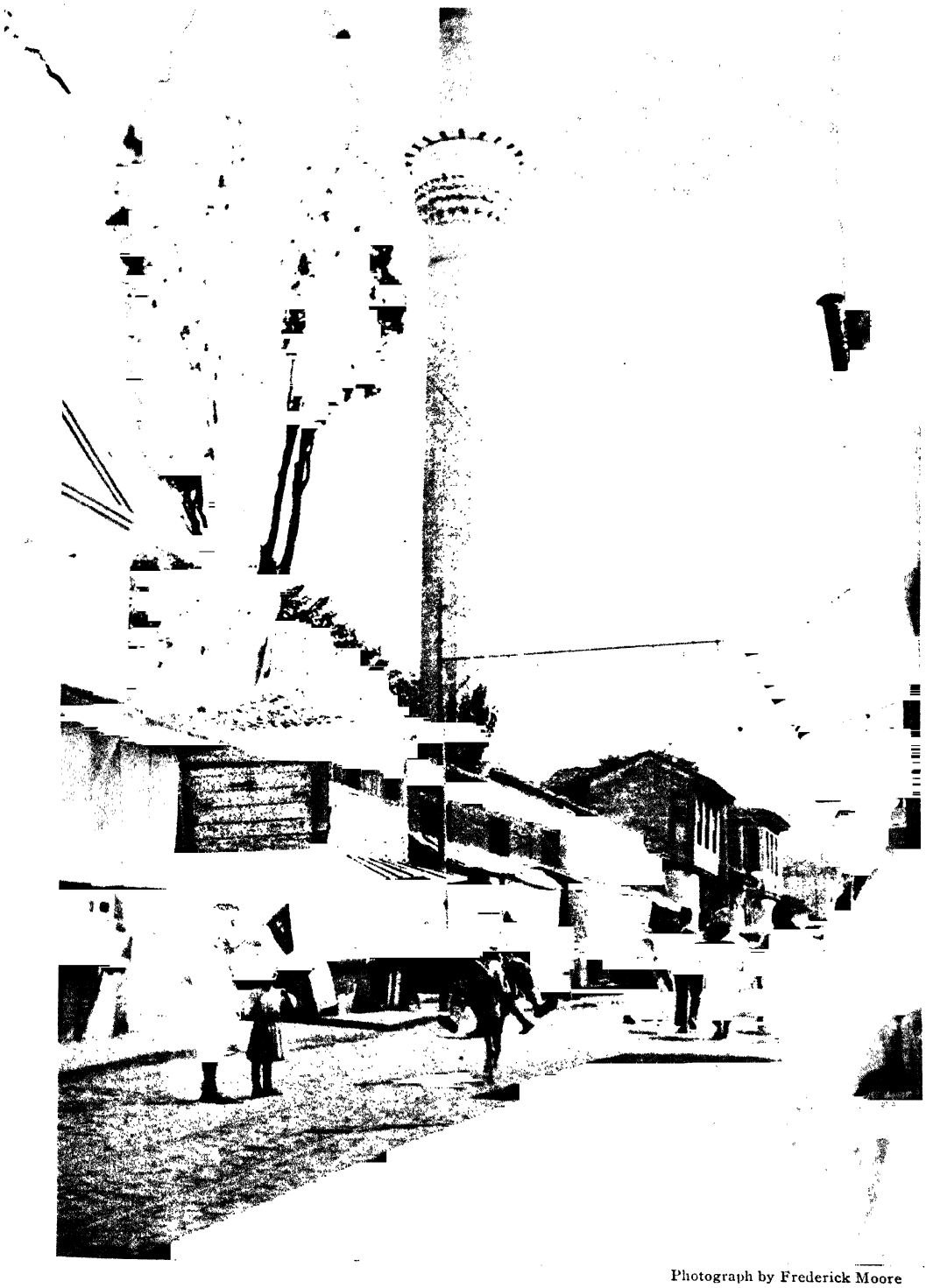
A year or two before their final departure from Saloniki the Turks set about destroying the remaining fortifications on the heights behind the town. The acropolis of the Macedonian city was here, and several fragments of the original Greek masonry remain. In Byzantine times the citadel was called the *pentepyrgion,* the five towers, from an inner circle of walls and towers that defend it. They contain many interesting monograms and inscriptions.

Saloniki possesses numerous other relics of archæological interest. The visitor is continually discovering fragments of antiquity — a pre-Christian tomb turned into a fountain, the stylobate of a statue carrying a street lamp, an intricate Byzantine carving set into a wall, a broken sarcophagus.

SALONIKI'S CHURCHES

But the finest remains of the ancient city are its churches. How they ever survived the tempests of the Middle Ages is a miracle. Nevertheless they did, twenty-two of them. And there they stand today, turned back into churches after their five hundred years of use as mosques, illustrating the story of Byzantine ecclesiastical architecture even more beautifully, in certain ways, than those of Constantinople. Moreover, they make up between them a museum of the lost Byzantine art of mosaic, unrivaled save in Constantinople and Ravenna.

The oldest of these churches, and after the arch of Galerius the most ancient



Photograph by Frederick Moore

THE STREET OF THE VARDAR: SALONIKI (SEE PAGE 209)



Photograph by Frederick Moore

THE ARCH OF GALERIUS ON THE STREET OF THE VARDAR, IN SALONIKI, GREECE

The arch is Roman, the driver, mayhap, is a Spanish Jew, and its passengers are Greek and Turk, Jew and Gentile, bond and free; for it is a congress of nations that gathers in Saloniki and the gamut of human conditions that its people run.



Photograph by F. J. Koch

THE TURKISH CANDY SELLER: SALONIKI

There is no law requiring the screening of food in Saloniki, and the traveler here, as well as elsewhere in southeastern Europe, wonders how many hundred million germs are sold with every sale of street-side sweetmeats.

monument in the city, is St. George. During the long Turkish period it was the mosque of Hortaji Süleïman Effendi. St. George is unlike any other church in Saloniki or Constantinople, in that it is of circular form (see page 220).

Its design, more characteristic of Italy than of the Levant, reminds us that Saloniki was more directly under Italian influence than under that of Constantinople, and that until the eighth century the city was, in religious matters, subject to Rome. The exterior of the church has no great effect and the dome is masked by a false roof. The interior is more imposing. The immensely thick walls contain eight vaulted recesses. Two of these are entrances, while a third, cutting through the full height of the wall, leads into the apse. The barrel vaulting of the recesses is encrusted with mosaics of great antiquity.

DID ROSI KNOW HOW TO SPELL?

Having begun to drop into ruin, these mosaics were handed over, some years since, to a restorer, who painted in what he lacked the means to replace. He also had the courage to sign his name, Rosi, to the result, causing the present witness of his infamies to question whether he even knew how to spell. His imitations, however, and the fragments of original mosaic give an idea of the invention and decorative sense that covered those ceilings with birds, flowers, and linear designs in blue and green and gold.

The dome of the church contains the finest mosaic in Saloniki and one of the finest in the world. The Roman, the pre-Christian air of St. George, is emphasized again in that series of classic-looking personages and buildings, divided architecturally into eight parts, corresponding to the eight openings below, but united by a mosaic balustrade that seems to guard the spring of the dome. At one point of the balustrade a peacock perches, his tail drooping magnificently toward the spectator.

Not the least interesting of the churches of Saloniki is St. Sophia. Like its greater



Photograph by Frederick Moore

THE WALLS OF SALONIKI

Saloniki is the terminus of four railroads—one running to Nish, Servia; another via Uskub to Mitrovitza, Albania; a third to Monastir, and a fourth toward Constantinople



Photograph by Frederick Moore

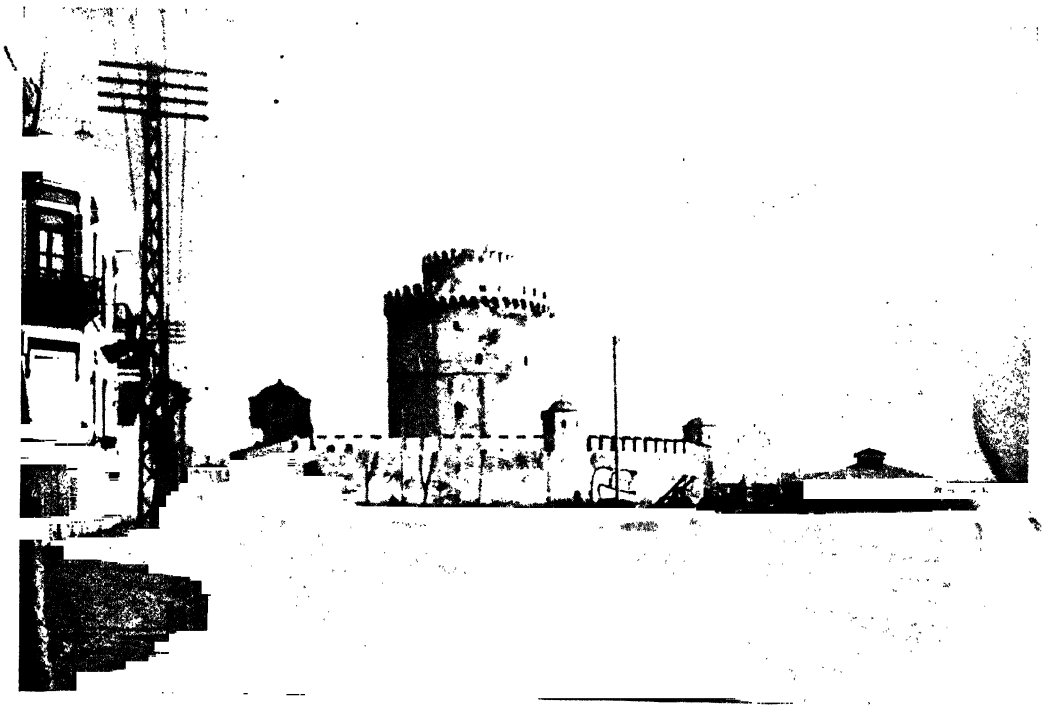
A GATEWAY IN THE CITY WALLS: SALONIKI



Photograph by P. Zepdji

THE CHURCH OF ST. SOPHIA BEFORE ITS RESTORATION IN 1910: SALONIKI

Until its last destruction by fire, in 1891, St. Sophia was one of the few Byzantine churches preserving its original atrium (see page 219)



Photograph by H. G. Dwight

THE WHITE TOWER, BUILT BY SÜLEÏMAN THE MAGNIFICENT (SEE PAGE 211)

homonym in Constantinople, it is a domed basilica, and it was long considered to be a provincial copy of that great original. As a matter of fact, the Saloniki church is the original, having been built a hundred years or more the earlier, at the end of the fourth or the beginning of the fifth century (see picture, page 218).

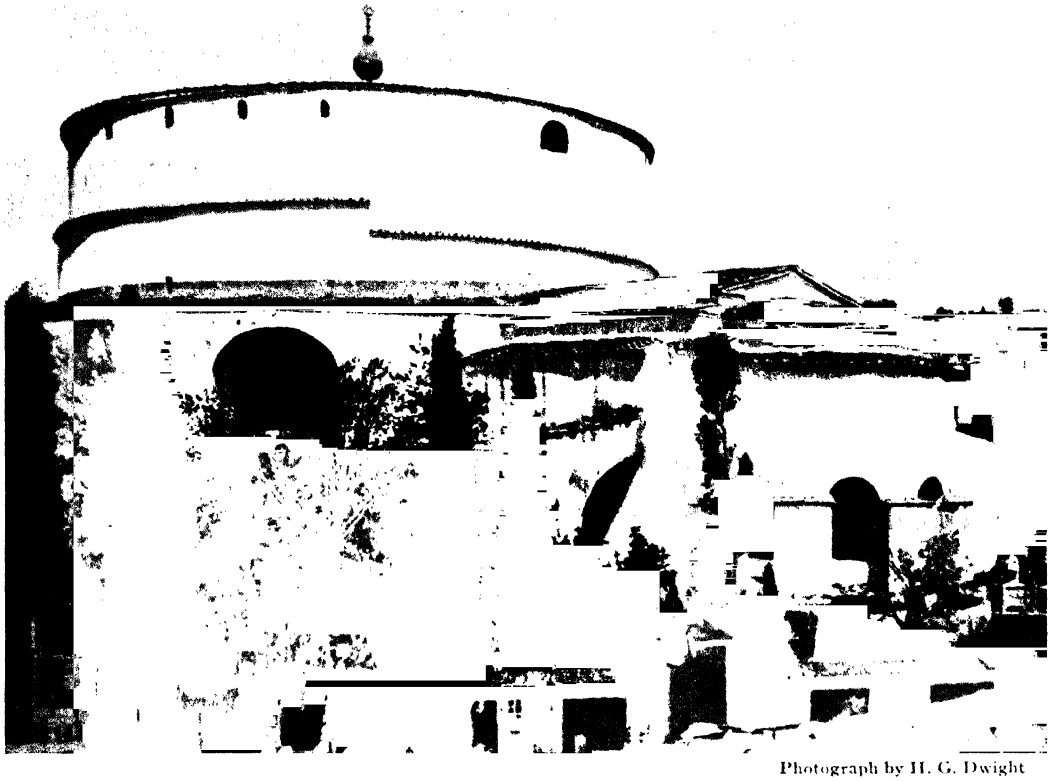
For the student of Byzantine architecture, therefore, it has a place of its own, as being a tentative solution of problems which Justinian's cathedral was so triumphantly to surmount. The church has suffered disastrously by fire, earthquake, and restoration.

But the original lines of the structure remain, the pillars and beautiful capitals of wind-blown acanthus, and two fine fragments of mosaic. In the vault of the bema is a gold cross inscribed in a circle, on a rich blue-green ground, while the golden semi-dome of the apse contains a seated Virgin and child—of the eighth century. The principal mosaic, an Ascension, with decorative green trees between the standing figures, lines the great dome. It is supposed to date from 645, though the figure of Christ in the center is older still.

SOME TURKS TOLERANT

I first saw these interesting mosaics while Saloniki was still a Turkish town. And it struck me as confirming in the Saloniki Turk, leader in the movement of his country toward western civilization, a tolerance less characteristic of his Asiatic brother—that decorations contravening every canon of orthodox Mohammedanism should remain to offend the eyes of the faithful. There are more mosaics to be seen in the larger St. Sophia of Constantinople, but none of them represent human forms or ornament the central parts of the structure.

This impression, repeated in St. George, was strengthened by the Cathedral of St. Demetrius. That five-aisled basilica, dating from the beginning of the fifth century, although restored and enlarged in the seventh, is the largest and best preserved of the Saloniki churches, as well as one of the finest structures of its type in existence.



Photograph by H. G. Dwight

THE CHURCH OF ST. GEORGE, KNOWN IN THE TURKISH PERIOD AS THE MOSQUE OF HORTAJI SÜLEÏMAN EFFENDI

"Its design, more characteristic of Italy than of the Levant, reminds us that Saloniki was more directly under Italian influence than under that of Constantinople, and that until the eighth century the city was, in religious matters, subject to Rome" (see text, page 215).

Although pillaged at the time of the Turkish conquest, it fortunately fell into the hands of the Mevlevi, more popularly known as the Whirling Dervishes, who are among the most tolerant of Mohammedans.

ALL MEN BROTHERS

The dervish who showed me about, on the occasion of my first visit, pointed out that the figures objectionable from a Turkish point of view had merely been covered with a curtain, adding that all men were brothers, and that mosques and churches alike were the houses of God.

St. Demetrius, at any rate, still contains much interesting and beautiful decorative detail. There are superb verd-antique columns on either side of the nave, their early Byzantine capitals are of great variety, and the spandrels of the arches are ornamented with charming designs of inlaid marble. There is also a good deal of mosaic in the aisles and the bema, the oldest being that of the north wall. It dates from the seventh century, though some of it has been retouched.

In spite of its early period the basilica has an oddly baroque air. This is chiefly due to an imitation of a cornice on a flat surface of variegated marble. And in one place the veined marble of the walls, sawn in thin sections from the same block, is so arranged as to simulate drapery.

In a dark chamber opening out of the narthex is shown what purports to be the tomb of St. Demetrius himself. But the real shrine was despoiled at the time of the Turkish conquest, and existed in another part of the cathedral.

PATRON OF THE HUSBANDMEN

A place like Saloniki might have suggested to Heine his fancy of gods in exile. St. Demetrius is not merely the successor of Aphrodite and the Cabiri in the prayers of the Thessalonians. He is, by some strange turn of fortune, the true heir of Pelasgian Demeter. As such, he is the patron of husbandmen throughout the Greek world, and his name day, November 8 (or October 26, old style), marks for Greeks and Turks alike the beginning of winter—as the day of his associate St. George, upon whom has fallen the mantle of Apollo, marks the beginning of summer.

Whether the Greek St. Demetrius and the Turkish Kassim be one and the same, this is not the place to inquire. But their fête day is the same, and the Cathedral of St. Demetrius was called by the Turks the Kassimieh. In any case, the good people of Saloniki, whether Christian or Mohammedan, must have found it highly significant that the Greek army of 1912 entered their city on the name day of their patron saint.

UNREALIZED OPPORTUNITIES

Many cities that can boast so much in the way of interesting antiquities have survived themselves. They live only in the memory of what they have been. But not so Saloniki. She is too much interested in what she is and in what she is going to be to think very much about her past. So little indeed has she yet taken in, as the remainder of Europe has so profitably done, the possibilities of a past, that I was unable to find there a map of the city.

And as I went from shop to shop in search of photographs of the churches I was followed by an officer looking vainly for a Baedeker. Imagine—in a town where one may live quite as comfortably as in Siena or Verona, and where there is quite as much to see!

Somebody had told me that Saloniki was rather like Genoa. My first impression, therefore, was of a disappointing flatness, not in the least comparable to the lofty air—the piled, bastioned, heaven-scaling air—of the Italian city. Yet Saloniki scales heaven, too, in her more discreet manner.

And there is even something faintly Italian about her. This is most palpable on the broad quay of the water front, especially when a veritable row of fishermen from the Adriatic are drying nets or sails under the sea wall, just as they do in Venice. The crescent of white buildings facing the blue bay would not look foreign in any Rimini or Spezzia.

The White Tower, which is the most conspicuous of them, might perfectly have been the work of an Italian prince. Indeed, a Doge of Venice is said to have built the first edition of it, and Süleïman the Magnificent employed Venetian masons for his own.

A GREEK "MOVIE" THEATER

A "splendid palace" opens florid gates of hospitality there. A skating rink and a cinematograph offer their own more exotic attractions to the passer-by. Cafés abound, overflowing onto the awninged sidewalk. Electric trams clang back and forth in proud consciousness of the fact that they existed when imperial Constantinople was yet innocent of such modernities.

They take you around the eastern horn of the bay to the trim white suburb of Kalamaria, where consuls and other notables of Saloniki live, and where Sultan Abd-ül-Hamid II spent nearly four bitter years in the Italian Villa Allattini, looking out at the provincial capital which he and Nero both embellished in their day. On the opposite horn of the crescent is the Latin-enough park of Besh Chinar—Five Plane Trees—where it is good to sip coffee and listen to music in the cool of the day.

And if you did not know that greater prize and ornament of Saloniki for Olympus, the true Thessalian Olympus of Greek legend, you might easily imagine it to be some white Alp or Apennine looming magnificently across the bay.

Look a little closer, however, and this Italian appearing town has unfamiliar details. The white *campanili* that everywhere prick up above the roofs of weathered red are too slender and too pointed



Photograph by H. G. Dwight

TURKISH HOUSES IN SALONIKI

This picturesque bridge, color-washed in red, and frescoed in quaint landscapes, leads from the mansion of its owner to his garden across the street

for true bell towers. Then, as you land at the quay you perceive that the electric cars are labeled in strange alphabets. The cafés do not look quite as they should, either.

A COSMOPOLITAN ASPECT

As for the people in them, a good many would pass without question. Just such slight and trim young men in Italy would sit at little tables on the sidewalk. Just such young women, rather pale and powdered as to complexion, rather dusky as to eyes and hair, would sit beside them. And you hear a good deal of Italian. But you hear more of other and less familiar languages. And those red fezzes are a new note. So are those more numerous hay-colored uniforms that sat at no *caffè* in my Italian days.

A more striking note is afforded by numerous dignified old gentlemen taking their ease in bath-robes, as it were, slit a little up the side and tied about the waist with a gay silk girdle. Over the bath-robe they usually wear a long, open coat lined with yellow fur, which guards them from the cold in winter and in summer from the heat. And none of them is without a string of beads, preferably of amber, dangling from his hand and giving him something to play with.

Such an old gentleman should be accompanied by an old lady, who contributes what is most characteristic to the local color of Saloniki. The foundation of her costume is a petticoat of some dark silk, and a white bodice crossed below her throat—a very thin bodice, cut very low at the neck, and very palpably unstiffened by any such mail as western women arm themselves with.



Photograph by H. G. Dwight

A BIT OF OLD SALONIKI

WHERE THE CAMERA FAILED

Over this substructure the old lady wears a dark satin bolero lined with fur and two striped silk aprons—one before and one behind. The latter is caught up on one side, some corner of it being apparently tucked into a mysterious pocket. But the crown and glory of the old lady is a headdress which I despair of describing. I wouldn't have to if the old ladies of Saloniki had not formed a conspiracy against me or thrown over me some incantation that put my wiles to nought.

For though I shadowed them by the hour, camera as inconspicuously as possible in hand; though I lay in wait for them behind corners and snapped at them as they passed, I never succeeded in properly potting one of them. Therefore I can only affirm that they wore on their heads, pointing down toward their noses, an invention that looked to me like the pork-pie hat of Victorian portraits—if such a name be not too abhorrent to those particular old ladies.

The Saloniki specimen is no true hat, however. It seems to be a sort of flat frame, tightly wound about with a stamped or embroidered handkerchief and crowned with an oval gilt plaque set off by seed pearls. Whatever its color, this creation invariably ends in a fringed tail of dark green silk, also ornamented by a gilt or gold plaque of seed pearls, hanging half way down the old lady's back. In this wonderful tail the old lady keeps her hair, of which you see not a scrap, unless at the temples. And about her bare throat she wears strings and strings of more seed pearls.

A MOTHER OF MANY

She is, this decorative, this often extremely handsome old lady, a mother in Israel. The old gentleman in the gaberdine is her legitimate consort, while many of the modernized young people at the café tables are their descendants—very many. A dozen different estimates of



Photograph by Zepdji

A GROUP OF BULGARIANS IN SALONIKI

One sees everywhere in this Greek metropolis reminders of the centuries during which Turkey ruled in Saloniki. Only the latest maps show Saloniki as a part of Greece, for it was only during the first Balkan War that the region of which it is the center became Greek territory.

the population were given me, varying according to the race of my informant; but they all agreed on the point that Saloniki contains not far from 150,000 people, and that more than half of them are Jews.

There is also a considerable Moslem population of Hebrew origin, mainly descended from the followers of Sabataï Levi, of Smyrna, a would-be Messiah of the seventeenth century, who created a great stir in this part of the world, and who, being at last offered his choice between death and Islam, elected the latter. Several of the Young Turk leaders belong to these *Dönmeh*, as they are called, or Those Who Turned. They are still looked upon a little askance by the orthodox of both confessions.

Altogether the Jews of Saloniki are more than a mere piece of local color. They hold their heads up as do their co-religionists in no other city in Europe—down to the very boatmen in the harbor.



Photograph by Frederick Moore

GREEK WOMEN OF DRAMA, NEAR THE BULGARIAN BORDER

"It is not surprising that a city so admirably placed, whether for defense or for communication . . . should long have been known to men" (see text, page 205)

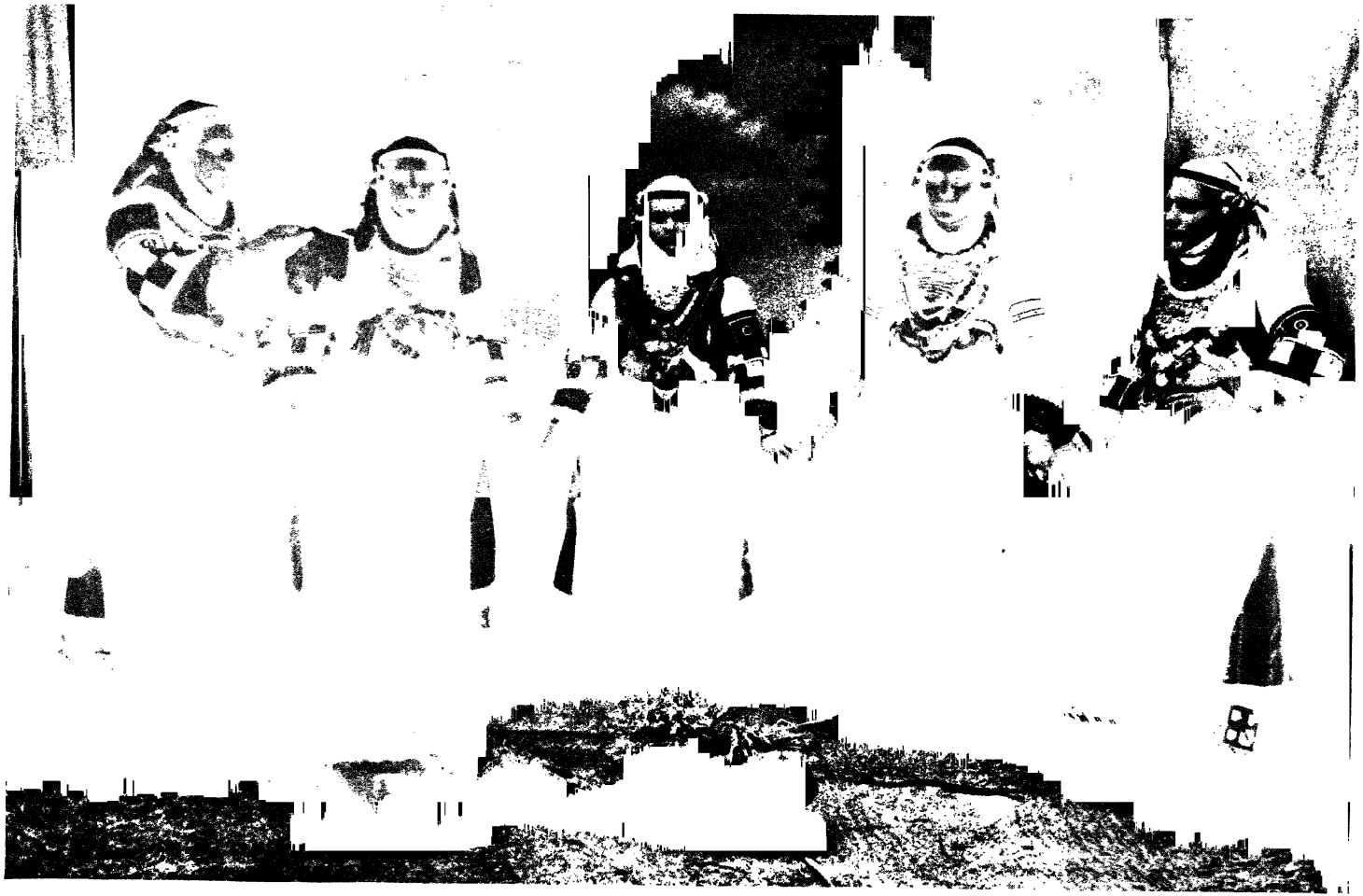
Pleasant, hearty-looking fellows the last are, too; fair-haired, many of them, and blue-eyed. The language of these children of Abraham is a corrupt Spanish. The fathers of most of them were driven out of Spain in the fifteenth century by Ferdinand and Isabella. Long before that, however, St. Paul mentioned a synagogue in the city of the Thessalonians.

PICTURESQUE COSTUMES PASS AND SCHOOLS ARE FILLED

I could not help regretting that the younger generation should renounce its picturesque heritage of costume. Yet I was told that the change had entailed the happiest results for Saloniki; had made a dirty medieval town cleaner and more comfortable than any other in its neighborhood; had filled shops and banks and schools. And it played in the greater domain of the Turkish revolution a part that has yet to be recorded.

Between the quay and the Street of the Vardar lies the New Jerusalem of this energetic population. The seaward part of it is a Latin-looking and Greek-speaking quarter for which Saloniki cherishes considerable tenderness. I preferred, myself, such portions of it as have not yet been Haussmannized, or Midhatized. For Midhat Pasha, father of the Turkish Constitution, was many years ago Governor General of Saloniki, and he left his mark in streets of uncommon straightness for the Levant.

Between them alleys of sharp light and shade meander under broad eaves, and glimpses of pleasant courts and loggias are to be caught through open doors. There also congregate many at the receipt of custom, the more favored of



Photograph by P. Zepdji, Saloniki

GREEK PEASANT GIRLS FROM THE CAMPANIA

"Women in hats, women in kerchiefs, women in embroideries that you want to buy off their backs—and sometimes do!—women in the Turkish domino, offer a complete exhibition of Balkan fashions" (see text, page 228)



Photograph by Frederick Moore

TWO GENERATIONS OF BULGARIANS AT DRAMA



Photograph by H. S. Cresswell

MACEDONIANS IN SALONIKI

Bulgarian peasant women dressed in the costume of Albania



Photograph by Frederick Moore

REFRESHMENTS IN SALONIKI

"As I listened to Mr. Black Eyebrow, looking about me at the red fezzes, the white skull-caps, the fur robes, and all the other variants of the Saloniki scene . . . I began to understand . . . why the equilibrium of races in Macedonia is so difficult to bring about" (see text, page 232).

them in roofed or awninged thoroughfares, into which the Ægean sunlight picturesquely drips.

A CONGRESS OF NATIONS

Little is Latin there. To loiter among the booths of the bazaar, to explore the busy squares and markets beyond it, to stroll in the crowded Street of the Vardar, or to idle among the coffee-houses of its western end, is to take in something of the Macedonian question. Fur robes and green pigtails are only incidents among many. Sedate red fezzes come and go. Tall Albanians, variously braided according to their tribes and wearing a white skull-cap on one ear, stalk through the crowd with that lordly swing of theirs.

Bulgarians, less lordly, but no less indifferent to the opinion of the world at large, mind their own business in brown home-spun. Kilted Greek peasants in tight white trousers tasseled under the knee, booted Montenegrins with hanging sleeves, lend the scene an operatic air.

Women in hats, women in kerchiefs, women in embroideries that you want to buy off their backs—and sometimes do!—women in the Turkish domino, offer a complete exhibition of Balkan fashions.

Beyond the Street of the Vardar the Turkish quarter begins. Saloniki is naturally less of a Turkish town than it was, when the Turks stood second and the Greeks third in the roll of the local babel. But while they have now changed places the fez still adds a very appreciable note to the color of Saloniki.

While Jews and Christians, too, live in this part of the city, the higher you climb the better you might imagine yourself to be in Stamboul. There are more stone houses, and some of them are unfamiliarly frescoed on the outside. The windows, though, are latticed, as they should be. There is a good deal of decorative iron work about them.



Photograph by Frederick Moore

THE BUTCHER: SALONIKI

"Saloniki is naturally less of a Turkish town than it was when the Turks stood second and the Greeks third in the roll of local babel. But while they have now changed places, the fez still adds a very appreciable note to the color of Saloniki" (see text, page 228).

LISTENING TO A NATURALIZED GRAMOPHONE

Upper stories lean out toward each other on curved wooden brackets. Stenciled under broad eaves, or hung there like a picture in a frame, is an Arabic invocation: "O Protector!" "O Proprietor of all Property!" Occasionally you pass a building like a mosque without a minaret, whose domes are studded with glass bulls' eyes and within whose doorways lounge half-nude figures in striped togas—a Turkish bath. And you keep discovering little squares where a plane tree or two make shadow, where water is sure to trickle, and where grave persons sit on rush-bottomed stools, sipping coffee, smoking water-pipes, and listening it may be to a naturalized gramophone.

At the tiptop of the hill you are stopped by the old walls, whose crenellations print themselves so decoratively across the sky as you look up the long streets from below. Or at least it was so the last time I mounted to that *Castellaccio* of this Levantine Genoa.

Even then, however, unsentimental crowbars were at work in that ancient masonry. Through the resultant breaches you look northward into a bare country that dips and mounts again to a farther background of heights. One reason why the country is so bare is perhaps that it was so long cut off from the city by the



Photograph by Frederick Moore

JEWS IN THE CITY OF SALONIKI

A more striking note is afforded by the numerous dignified old gentlemen taking their ease in bathrobes, as it were, slit a little up the side and tied with a gay silk girdle" (see text, page 222)



Photograph by Frederick Moore

STREET BARBERS IN THE TURKISH QUARTER

"And you keep discovering little squares where a plane tree or two make shadow, where water is sure to trickle, and where grave persons sit on rush-bottomed stools, sipping coffee, smoking water-pipes, and listening, it may be, to a naturalized gramophone" (see text, page 229).



Photograph by H. G. Dwight

A SCENE IN THE VEGETABLE MARKET: SALONIKI

walls. It is, of course, well for the town that it should have room to grow, as for the country that it should be reclaimed from the abomination of desolation.

But, being an irresponsible and sentimental tourist, I was sorry to see those old stones dislodged. I was sorry, too, for the storks. They congregate so picturesquely among the battlements of Yeni Kapou that one wishes Saloniki might take a tardy lesson from Florence and save at least her gates.

THE VIEW REMAINS

However, no one can ever take away the view, and that is the best reason for climbing to this storied hilltop. They say that Xerxes of Persia, to whom blue water was a rare enough sight, sat here long and admired the spectacle of the underlying gulf, set jewel-like between its hills, with Olympus towering white at the end of the vista.

If he did, I think better of him than he otherwise deserves. I also highly approve the taste of the Turks in preferring this part of Saloniki. Its hanging coffee-houses are not so popular, to be sure, as those of Besh Chinar, the quay, or the Street of the Vardar. Yet one of them I remember better than any other in the town. Under its plane trees I had the pleasure of hearing a certain famous Turkish singer. The famous singer was called Kara Kash Effendi, otherwise Mr. Black Eyebrow.

Mr. Black Eyebrow sat in a small krosk, surrounded by a chosen company of players on lutes and tambourines, who attended respectfully the descent upon their master of the divine afflatus. When the divine afflatus descended, Mr. Black Eyebrow put his hand to his cheek, as Turkish singers do—I know not whether to aid their strange crescendo—and poured forth the melancholy of his heart in a manner which most westerners profess to find laughable.

Whereby they prove again that what we like is what we are used to, and that few be they capable of taking in a new impression. For myself, having long been used to such singing, I could have listened all day to the melancholy of the heart of Mr. Black Eyebrow. It seemed to form a singular medium of twilight, in which the imagination played easily as a bat.

SO THE PERSIANS MUST HAVE SUNG

So I thought the Persians must have sung down there in ancient Therma, as they gathered for their march to Thermopylæ. So sang, perhaps, the Moors in Spain. And so the Janissaries sang when they had driven the lion of St. Mark out of that blue bay.

As I listened to Mr. Black Eyebrow, looking about me at the red fezzes, the white skullcaps, the fur robes, and all the other variants of the Saloniki scene, I suddenly realized for the first time in my life why it is that a *macédoine* in a French bill of fare is a dish with a little of everything in it. And I began to understand, what no outsider can in his own country, why the equilibrium of races in Macedonia is so difficult to bring about, and why any final equilibrium must necessarily be in part an artificial one. I could not help hoping that that particular *macédoine* has been served for the last time.

At any rate, no one can deny that the Greeks have an older claim to Saloniki than any one else. Yet I could not help feeling a little sorry for Mr. Black Eyebrow and appreciating that not without reason did he pour forth melancholy from his heart.



Autochrome by Franklin Price Knott

AN ARAB BLACKSMITH

Except for his multi-colored turban, this strong-visaged native of Sfax, Southern Tunisia, looks as if he might have posed for one of Rembrandt's immortal masterpieces. From father to son the blacksmith's occupation is handed down, each leaving to his successor the heritage of a reputation for skilful workmanship, even though his implements be primitive and his wage meager.



Autochrome by Franklin Price Knott

A SHY KABYLE BEAUTY

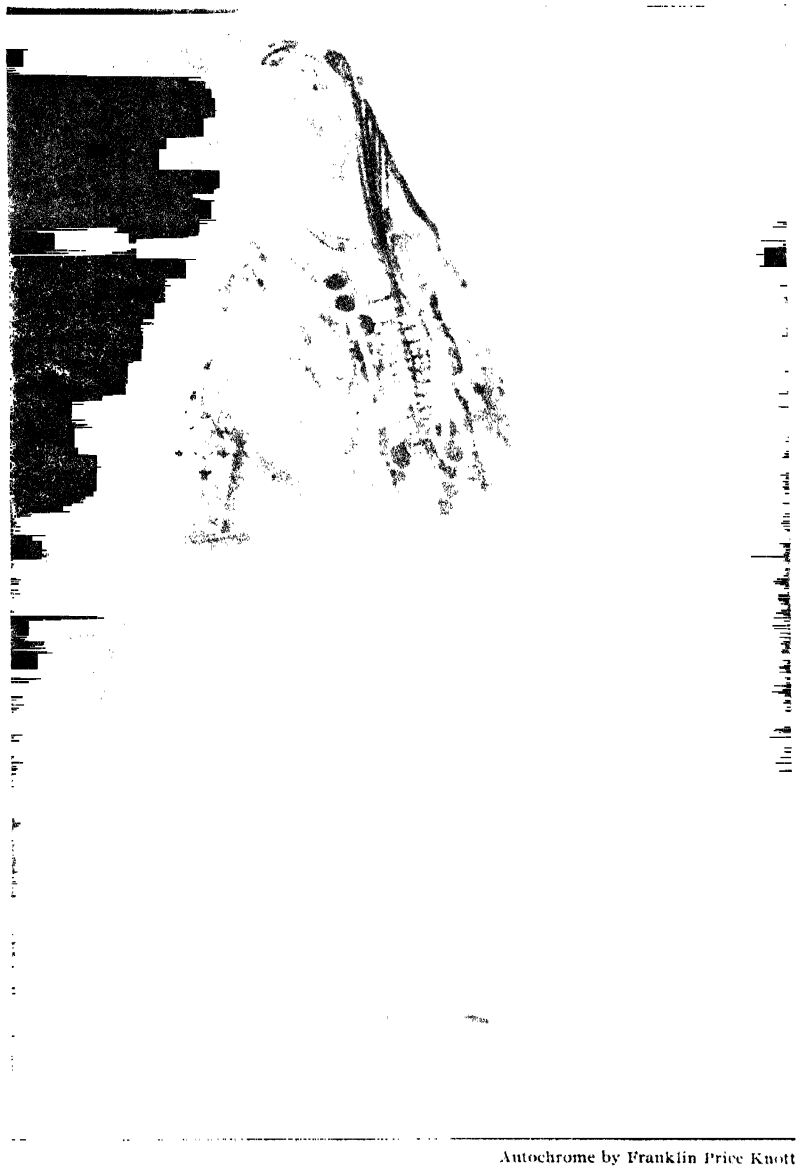
There would seem to be no feminine reason why this picturesque young woman in her brilliant costume should object to standing as a model before the color camera, but she, like the other girls in the neighborhood of Michelet, Tunisia, eluded the artist for many days. As fleet of foot as a gazelle, she would have made her escape had not the Mother Superior of the Government hospital persuaded her to pose for the stranger, which she did with unconscious grace.



Autochrome by Franklin Price Knott

A LAMB'S WOOL BOA

So closely attached to his flock is the shepherd of the East that when necessity compels him to select one of the number for the market, he "tempers the wind to the shorn lamb" by carrying the victim about his neck instead of driving it before him to slaughter. This tawny native of Tunisia has the thoughtful countenance of a Moorish philosopher of the days when Granada was the center of culture in Western Europe.



Autochrome by Franklin Price Knott

A DANCER OF ALGIERS

With richly spangled jacket, jeweled headdress, voluminous scarlet trousers, and gold-encircled ankles, the dancer is a more fascinating figure for the color artist than for the motion picture photographer, and as a still study requires no censorship.



Autochrome by Franklin Price Knott

A SUDANESE AND HIS RACING CAMEL

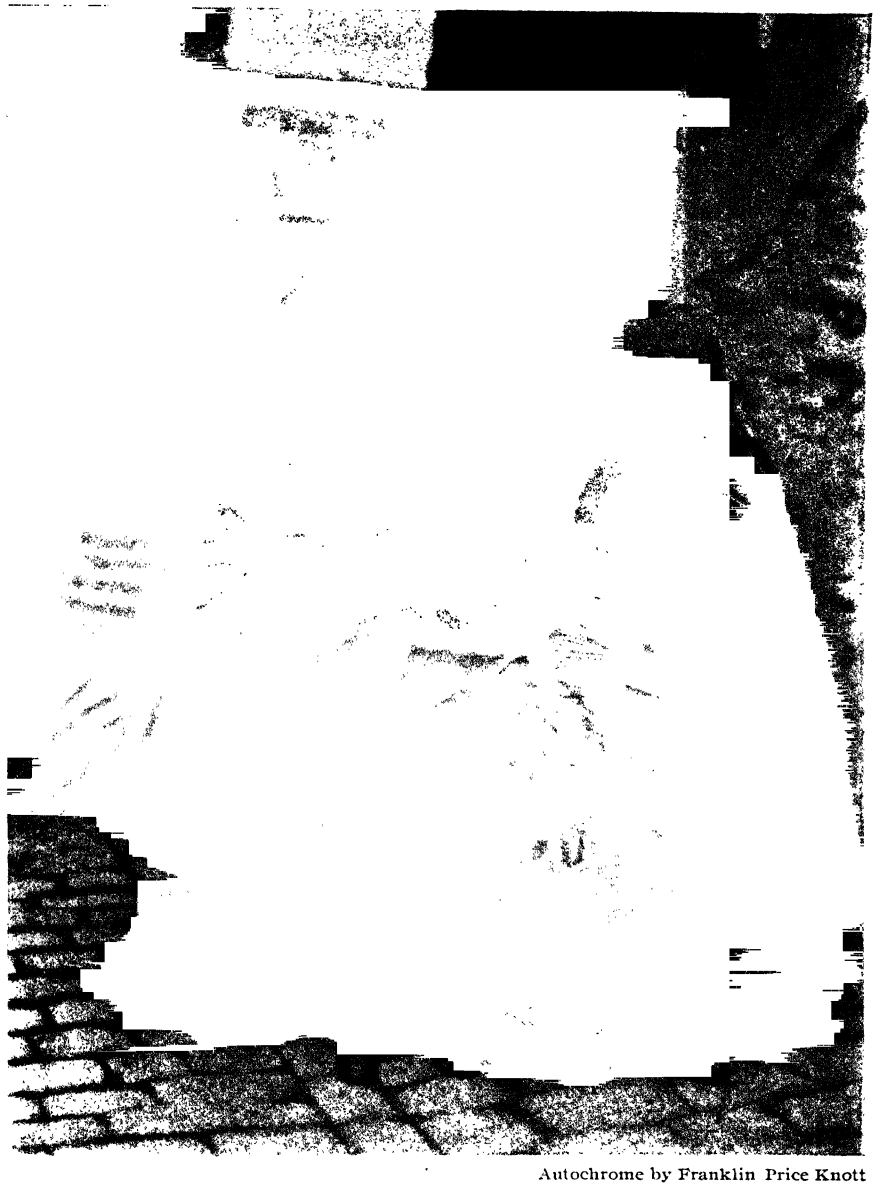
While not so rare as the white elephant or the white rhinoceros, white camels are a novelty to American eyes for they seldom find their way into circus caravans. This clipper-rigged "ship of the desert" and his swarthy skipper were photographed near El Djem, in southern Tunisia. A hundred miles a day is not an extraordinary distance feat for the mehari, as the racing camel is called.



Autochrome by Franklin Price Knott

WHEN AGE COMES ON IN ALGERIA

The women of the Kabyle tribe, living in the Djurdjura Mountains, Northern Algeria, show the footprints of time early in life, as do the native women in all tropical climes and especially among semi-civilized peoples. This burden-bearer is a picture of poverty.



Autochrome by Franklin Price Knott

A CARROT PEDDLER AND HIS PACK BEARER

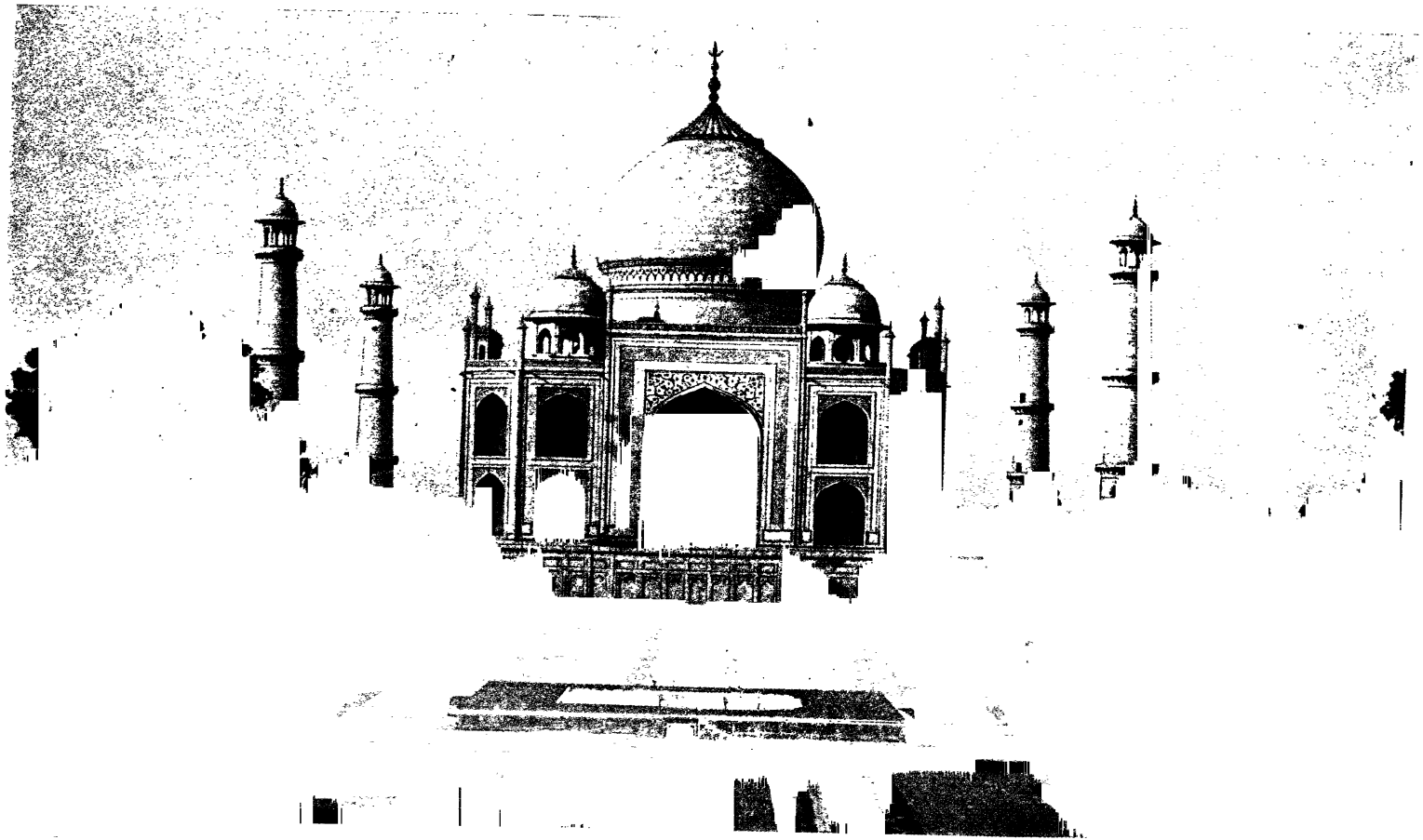
Master and beast in a Tunis street appear the personification of lassitude. The peddler is as oblivious of the colorful beauty of the Moorish column in the background as is the donkey of the juicy provender on its back.



Autochrome by Franklin Price Knott

DANCING GIRLS OF THE OULED NAÏLS

These desert devotees of Terpsichore affect brilliant costumes and glittering ornaments not only through their love of finery but because such personal adornment increases their earning capacity as dancers in the bazaars of Algerian towns, thereby hastening the day when, with dowry amassed they can return to the tents of their tribe and there find eager suitors among the young fortune hunters of their own people.



Autochrome by Franklin Price Knott

TAJ MAHAL: AGRA, INDIA

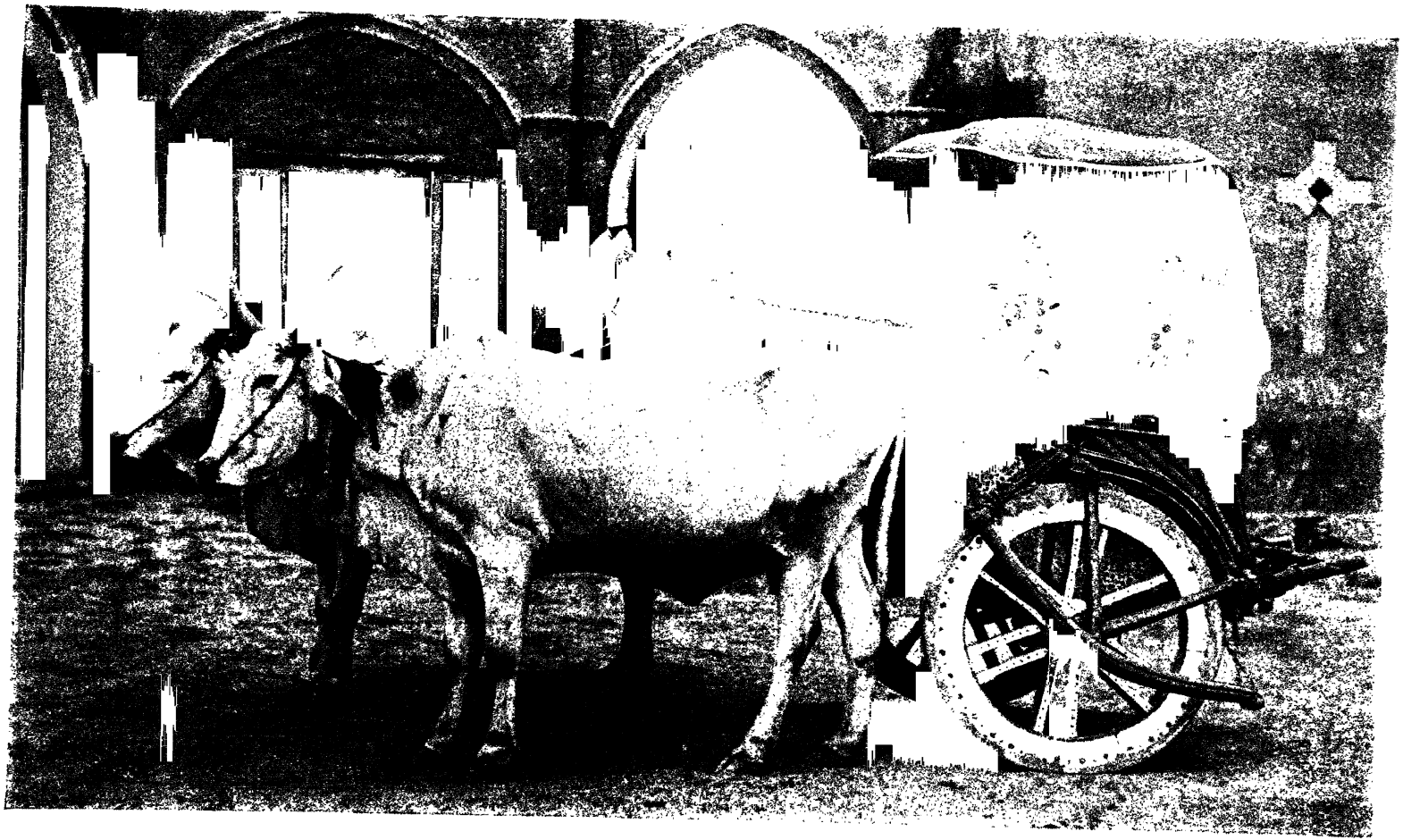
The transcendent grace and symmetry of this monument of a pagan emperor to the memory of his favorite wife, have, like the inscrutable smile of the Mona Lisa, baffled the descriptive powers of poets of every clime. It is as if Shah Jahan had "thought in gold, dreamed in silver, imagined in marble and in bronze conceived." For three hundred years it has dazzled pilgrim nations and of all the wonders of the world created by the hand of man it seems the very soul of beauty—a poem in marble, a symphony in stone.



Autochrome by Franklin Price Knott

AFTERNOON COFFEE IN KAIROWAN

In Tunisia the thick, almost viscous Turkish coffee supplants the English tea and the American grape-juice as a social stimulant. At frequent intervals during the day work is suspended long enough for a brief sip and an exchange of news. In the picture the improvised coffee-house is the doorway of a carpenter shop.



Autochrome by Franklin Price Knott

AN ORIENTAL TAXICAB

Seated in this canopied vehicle with wooden springs, and drawn by stately white oxen, which are guided by means of nose bridles, these daughters of Delhi seem to find the world a joyous place in which to live. Not so the somber master of the retinue who is evidently considering the traffic laws concerning speed.



Autochrome by Franklin Price Knott

THE TOWER OF JEWELS

A blaze of coruscant splendor at night and a graceful pinnacle of rainbow tints by day, this structure was the color climax of the Panama-Pacific Exposition. In the foreground is a carpet of riotous hues from Nature's flower loom, which weaves more brilliantly and luxuriantly in California's sunshine than under any other skies. The musical play of many fountains delighted the ear while the eye feasted upon the beauties so abundantly realized by architect and landscape gardener.



Autochrome by Franklin Price Knott

THE GREATEST ARTIST OF HER TRIBE

This is Nanpeo, the famous Hopi pottery maker, now nearly blind. But her gift for ceramic decoration is to be transmitted through her daughters, who have been carefully instructed in the use of designs which have a religious symbolism as well as esthetic qualities. Nanpeo is wearing a typical Hopi costume.



Autochrome by Franklin Price Knott

HER HOME IS VOLENDAM, HOLLAND

And the face of this Dutch girl reflects efficiency, sturdiness and thrift, qualities which make the women of her country among the best housewives in the world. So quaint are the costumes of the fisher-folk of this village that a colony of English and Dutch painters has been established here, and artist models are as numerous as the inhabitants. On Sundays the natives are seen in their most striking attire.



Autochrome by Franklin Price Knott

A MASTER'S MODEL

Franz Hals would have made this Dutchman immortal by transferring to enduring canvas his striking features, quizzical and highly individual. His bearskin cap, vivid neckerchief and flaming blouse would tax the skill of any master of pigments who tried to reproduce them with the fidelity and freshness which have been accomplished here by the allied arts of natural color photography and color-printing.



Autochrome by Franklin Price Knott

WEATHER PROPHETS

Constantly facing death not only on the storm-swept waters of the North Sea but in every ocean on the face of the earth, the hearty Dutch sailors have learned to predict fair weather or foul with an accuracy of which any scientific meteorological bureau would be proud. Upon their knowledge of the elements depend the peace and plenty of those residing in the quaint cottages which border this picturesque canal "Somewhere in Holland."

THE HOARY MONASTERIES OF MT. ATHOS

By H. G. Dwight

EXTENDING out into the Ægean Sea from the mainland of Chalcidice, in northeastern Greece, like the prongs of a trident, are three peninsulas. They leave the mainland some forty miles southeast of Saloniki and look as though they might be the fork with which Neptune planned to throw the island of Chios, on the Smyrna coast, out of the sea. The easternmost of these peninsulas is that of Athos, named from the great terminal peak which rises like a pyramid out of the sea at its Ægean end. The peninsula is about forty miles long, varying in width from four to seven miles, and it is entirely owned and controlled by a group of monastic communities, which govern it under a republican system (see map, page 271).

Mt. Athos chose to make its first appearance to us in the melodramatic light of a midnight moon—a pale pyramid looming vaguely above a high black ridge, where a few lamps glimmered far apart. Such a light was needed to lend interest to Daphne, the port of the peninsula. In the less romantic clarity of a March morning it appeared a dingy little hamlet enough, consisting of a customhouse, a postoffice, an inn, and the quarters of the few residents so unfortunate as to be stationed there.

WHERE NO WOMAN MAY TREAD

In normal times of peace a weekly Russian steamer and occasional Greek ones constitute the sole incidents of their lives, deprived, as they are—shall I say of what is for other men the great interest of life? For I must reveal to you, O feminists, suffragists, suffragettes, and ladies militant of the western world, that here is a stronghold secure against your attacks.

To put it more plainly, an ancient law forbids any female creature to set foot on the soil of the Sacred Mount. As one might expect, of course, in a world inhabited by descendants of Eve, that law has been broken. There are legends of inquisitive empresses who were miraculously prevented, at the door, from defiling certain monasteries by their intrusion. There are other legends of monasteries subjected to fasting, humility, and purification by reason of some such uninvited guest.

Moreover, a monk confessed to me in whispers that during the terror of the Greek War of Independence his mother spent several months in asylum at the monastery of St. Paul. And I have seen water-colors of several of the monasteries painted by Miss Canning, daughter of the famous British Ambassador, Lord Stratford de Redcliffe, who boldly accompanied her father to Mt. Athos in the uniform of a midshipman of the Royal Navy. But no such blinking of the law is possible to an inn-keeper or unhappy officer of customs.

Even the furred and feathered colonists of Mt. Athos are supposed to leave their harems at home. Neither cow nor hen wakens the echoes of the monastic community, and the monks' kitchens are supplied with milk, butter, and eggs from their distant farms on the mainland. The dispiriting effects of celibacy are nowhere so visible as among the army of tomcats that haunt the cloisters. I must confess, however, that I more than once had reason to suspect a shameless *bayadère* of a tabby of having secretly stolen across the border.

And our mules had not borne us far from barren Daphne before we perceived other indications that the monks had not altogether succeeded in eradicating the eternal feminine from their midst. We presently turned from the rocky seashore into a gorge with a stone bridge at the bottom of it and a waterfall hanging half way from the top, where birds called so cozeningly to each other that I can never believe only bachelor birds were there.

"SPRING WILL BE SPRING"

Then as we zigzagged up a roughly paved trail that looked from a distance



Photograph by H. G. Dwight

THE MONASTERY OF IVÍRON: MT. ATHOS, GREECE

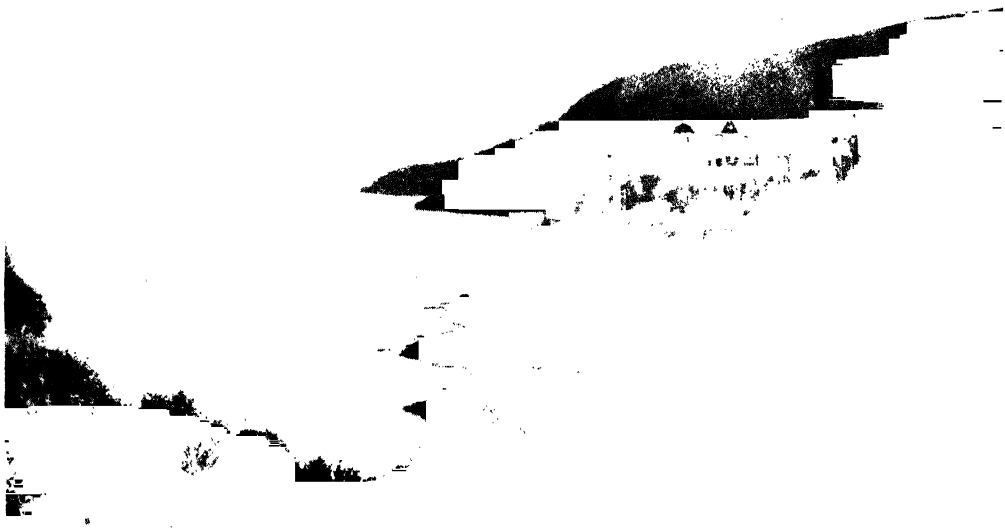
Ivíron disputes with Vatopéthi the honor of being the second oldest monastery on Mt. Athos. Ivíron was founded in the tenth century, under the Empress Theophano. It was later restored and enlarged by a Georgian prince; hence the name, for the Georgians of the Caucasus were known to the Greeks as the Iberians.

like a coil of rope dropped at random on the mountain side, up and up past terraced olive trees, past a white monastery looking pleasantly at the sea from a high green shelf, past reaches of budding wood, to a dip on top of the ridge, we came upon great shrubs and fair-sized trees of holly, so plenteously burdened with big red berries that the monks should have destroyed them, root and branch, had they properly studied their botanies. We also saw blossoming heather, broom, violets, anemones, spikes of classic asphodel, and I know not how many other proofs that spring will be spring in spite of all the monks in the world.

And amid them all two great crosses stood black on either lip of the hollow against a far-away sea. So we dropped at last, through what must once have been a magnificent wood, to the village of Karyés.

Karyés, otherwise The Walnuts, is the capital of the community. It lies just under the crest of the peninsula, about midway of its long eastern slope. An ignorant newcomer runs fresh risk of incurring displeasure, even when he has left his wife behind; for in the streets of this other-worldly capital may no man ride, smoke, sing, or otherwise comport himself in too self-satisfied a manner.

Dismounting, accordingly, at a stone block provided for that purpose, we had the more leisure to admire Karyés—its crooked alleys, its broad eaves, its omnipresent crosses, its running water, its hanging gardens, its sudden visions of white-capped Athos or the underlying blue of the Ægean, and its grave, bearded black-gowned inhabitants, with uncut hair tucked under black stove-pipes; true stove-pipes they were, too, having neither



Photograph by H. G. Dwight

THE MONASTERY OF PANTOKRATOR: MT. ATHOS, GREECE

This small but picturesque monastery, standing near the edge of the sea on the east side of the peninsula, enjoys a wide view of the Ægean and of the peak of Athos. Founded in the fourteenth century, it is the seventh of the monasteries in point of age.

the brim of the West nor the upper flare of the Greek clergy (see page 270).

Not all the inhabitants were gowned, however. Some wore white Albanian ballet skirts, tasseled garters below a tight white knee, and a pompon at the turned-up tip of each red slipper. These, we learned, were members of a local pretorian guard. Others were less amply kilted or trousered in different degrees of bagginess; and not a few looked as prosaic as ourselves.

WHERE VISITOR IS GUEST

Our muleteer was a little surprised that we preferred to put up at an inn instead of at one of the monastic establishments in the suburbs of Karyés. The reason of his surprise lay in the fact that for many travelers the true beauty of a pilgrimage to Mt. Athos is that not only do you lay up credit for yourself on high, but that you do it for next to nothing. Any one belonging to the worse half of humanity may visit the monasteries and be gratuitously entertained so long as he cares to stay.

So many avail themselves of this hospitable privilege, however, that there are degrees in the welcome extended by the monks. If, for instance, the pilgrim bring a letter from known ecclesiastical authorities, he will receive more consideration, and may even receive money for his own purposes or for others commended to the generosity of the fathers. We were not happy enough to possess a letter of that particular kind; but we did bring a letter from the highest of all ecclesiastical authorities in the Greek world, namely, the Patriarch of Constantinople. In theory, therefore, we were entitled to the best the monasteries had to offer and transportation from one to another by mule or boat. For ourselves, we found this scheme of things more embarrassing than otherwise, and in most cases it either increased the expense of our sojourn or caused us unwillingly to hasten our departure.



THE MONASTERY OF XENOPHÓN : MT. ATHOS, GREECE

Photograph by H. G. Dwight

There are few landscapes more picturesque and few seascapes more restful and charming than those of the inlets and coves of Athos, 40 miles from Saloniki



THE MONASTERY OF VATOPÉTHI: MT. ATHOS, GREECE

Photograph by H. G. Dwight

This large, rich, and ancient monastery stands second in the hierarchic order of the peninsula. Its greater wealth, size, and accessibility give it an influence on the peninsula second to none. According to local legends, Vatopéthi was founded by the Emperor Constantine the Great. Julian the Apostate is said to have destroyed the monastery of Constantine, which was rebuilt and enlarged by Theodosius the Great in gratitude for the miraculous escape from drowning, in Vatopéthi Bay, of his young son Arcadius. Arcadius himself, after mounting the throne, is credited by local tradition with many benefactions toward the monastery. In 862 it was sacked and burnt by Saracen pirates.



Photograph by H. G. Dwight

THE MAIN STREET OF KARYÉS: MT. ATHOS, GREECE

"Karyés, otherwise the Walnuts, is the capital of the community. It lies just under the crest of the peninsula. An ignorant newcomer runs fresh risk of incurring displeasure even when he has left his wife behind; for in this other-worldly capital may no man ride, smoke, sing, or otherwise comport himself in too self-satisfied a manner" (see text, page 250).

But we made it our first duty in Karyés to deliver our credentials, very soundingly worded and wound about with a long strip of paper stuck to the flap of the envelope, to the Most Blessed Assembly of the Sacred Mount, whose address it bore.

OLDER THAN WESTMINSTER

The Most Blessed Assembly of the Sacred Mount — or, more briefly, the *Kinótis*—is a very interesting body. Mt. Athos has always enjoyed special privileges, whether under Byzantine emperors, Turkish sultans, or its present suzerain the King of Greece; and the monasteries have always ruled their own peninsula. Of these there are now twenty, and they administer their common affairs through a parliament even more venerable, I believe, than Westminster. Each monastery annually elects a representative to this parliament, who occupies at Karyés a house belonging to his abbey.

These houses preserve the memory of the long Turkish régime, in that they are known by the Turkish name of *konák*—mansion. Always roomy and substantial, and sometimes handsome, they and the gardens in which they stand add not a little to the appearance of the diminutive capital. In addition to the *Kinótis*, which is a deliberative, legislative, and judiciary assembly, there is a smaller executive council of five, called the *Epistasía*. The members of this smaller council may or may not be members of the *Kinótis*, being elected by groups of four monasteries for a term of five years.

The parliament house of Karyés is not a very imposing structure, but it makes a picturesque group in the center of the town, with the cathedral of the commu-



Photograph by H. G. Dwight

ON THE RIGHT IS THE GUEST HOUSE OF VATOPÉTHI: MT. ATHOS, GREECE

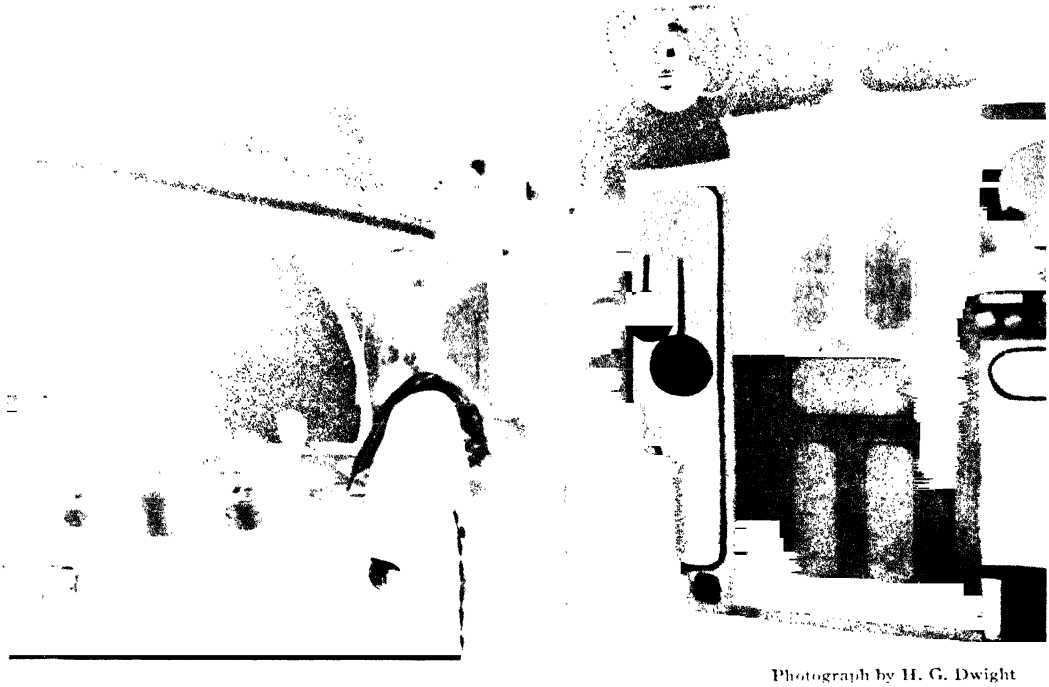
According to Riley, whose book, "Athos the Mount of the Monks," is an authority, more than 250 tons of grapes are made into wine at the Vatopéthi Monastery annually, and each monk and servant gets a daily allowance of wine.

nity and the square old tower beside it. Far more imposing was the pretorian guardsman, who stood at the gate. Four of these, we later learned, are attached to the service of parliament, while a larger standing army of 20 men, called *serdárs*, scour the lonely trails of the peninsula.

THE ETIQUETTE OF THE TRAY

Having sent in our letter by the hand of the white-kilted warrior, we presently had the honor to be received by the Council of Five, in a long, bare room almost entirely surrounded by a low divan. Two of the councilors spoke French, it appeared, which comforted us not a little in discharging the formidable compliments of the occasion. Then, while the secretary prepared the circular, which we were to have in exchange for our patriarchal missive, one of the guardsmen appeared before us with a tray. Its bewildering multiplicity of spoons, saucers, glasses, and refreshments presented well-nigh insoluble problems. I am not sure that we solved them with perfect correctness then; but since we never paid a visit on Mt. Athos without meeting the counterpart of that tray, I am now prepared to expound its etiquette to any prospective traveler in the Levant.

You choose a spoon; you dip it into a jar of preserves; you put it into your mouth and turn it gracefully over, in order to lose nothing of its sweetness; you drop it into a glass of water provided for that purpose; you drink a little water from another glass; you raise a third glass, containing a heady liqueur, with as handsome a speech to the company as your knowledge of strange tongues will devise; you drink—if you choose—more water, and you end with a cup of Turk-



Photograph by H. G. Dwight

THE KITCHEN OF THE GUEST HOUSE AT VATOPÉTHI: MT. ATHOS, GREECE

Covel, who also seems to have made his pilgrimage during Lent, says of this kitchen: "They gave us Limpets there thrice as big as oures in England, and yellow, all cover'd with a fat yellow mosse, which they eat either alone or with oyl."

ish coffee, which you sip as noisily as possible in order to express your appreciation of it.

A WELL-SEALED INTRODUCTION

Upon this ceremony followed that of sealing our circular. Each of four councilors produced a quarter of the seal, while the fifth, the secretary, locked them into a handle in his own possession. Our letter was then formally stamped, the resultant image of the Virgin was sanded in the good old way, and we were ready to begin the more serious part of our pilgrimage.

First, however, one of the French-speaking councilors very courteously offered to show us the sights of Karyés. Chief among these was the neighboring cathedral, known on the peninsula as the *Protáton*. It is a cruciform church of the tenth or eleventh century, containing a famous icon of the Virgin and decorated with some of the most interesting Byzantine frescoes that remain. Whether they were or were not painted, as the monks affirm, by the half-mythic Athonite master, Pansélinos, who flourished at the end of the fifteenth or the beginning of the sixteenth century, it is not for me to say. But they certainly preserve the tradition of another time. A St. John in particular, painted so high on the wall that I could not photograph it properly, recalls the noble Byzantine mosaics of Cefalù.

Our venerable guide also took us to visit the small monastery of Koutloumoúsi, on the outskirts of Karyés, where the problem of spoons and glasses was again presented to us. And we encountered it a third time in the councilor's own *konak*, a big, bare, clean house commanding magnificent views of mountain and sea. He furthermore insisted that we should move our traps there from the



Photograph by H. G. Dwight

A VIEW OF VATOPÉTHI: MT. ATHOS, GREECE

Some idea of the extent of this monastery may be gathered from the statement that it covers four acres, contains sixteen churches, large and small, and has so many buildings that it resembles a fortified town.

rather grubby little establishment—half shop, half inn—where we had deposited them.

A LESS FORMAL SOCIETY

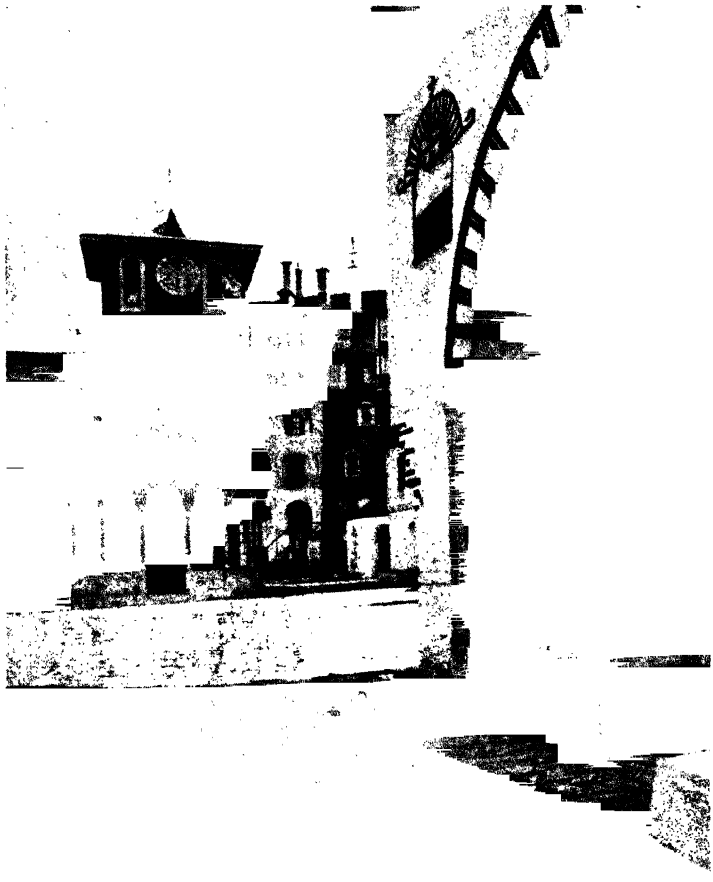
We were happy to accept the hospitality of this kind and intelligent father, who showed us many other courtesies during the course of our pilgrimage, and who interested me the more because he happened to be an Albanian. But truth compels me to add that I also returned with pleasure, more than once, to that same inn. Perhaps it was because our pilgrimage fell in Lent, when monks fast more strictly than laymen. Perhaps it was because I have a leaning toward low company.

At all events, quite as characteristic as the more formal society to which our letter introduced us, I found the society at the inn, where shopkeepers, muleteers, laborers from monastery farms, pilgrims of the poorer sort, hermits, itinerant monks, and other wanderers gathered daily and nightly in the public room or in the court of flower-pots and budding vines behind it.

We had had interesting glimpses of two or three monasteries and had become acquainted with a number of their inmates; but it remained for us to have our first real taste of monastic life at Vatopéthi. I write the name hesitatingly, knowing that my choice of letters will not please the more learned of my readers. No monk, however, would have any idea what you meant if you spoke of Batopedion. I therefore persist in attempting to convey the local pronunciation, which accents the penult and hardens the *th*.

A MEMORABLE JOURNEY

Not the least memorable part of the experience was the journey from Karyés, which we performed by mule in some three hours. The trail—for so narrow



Photograph by H. G. Dwight

THE CLOCK TOWER OF VATOPÉTHI: MT. ATHOS, GREECE

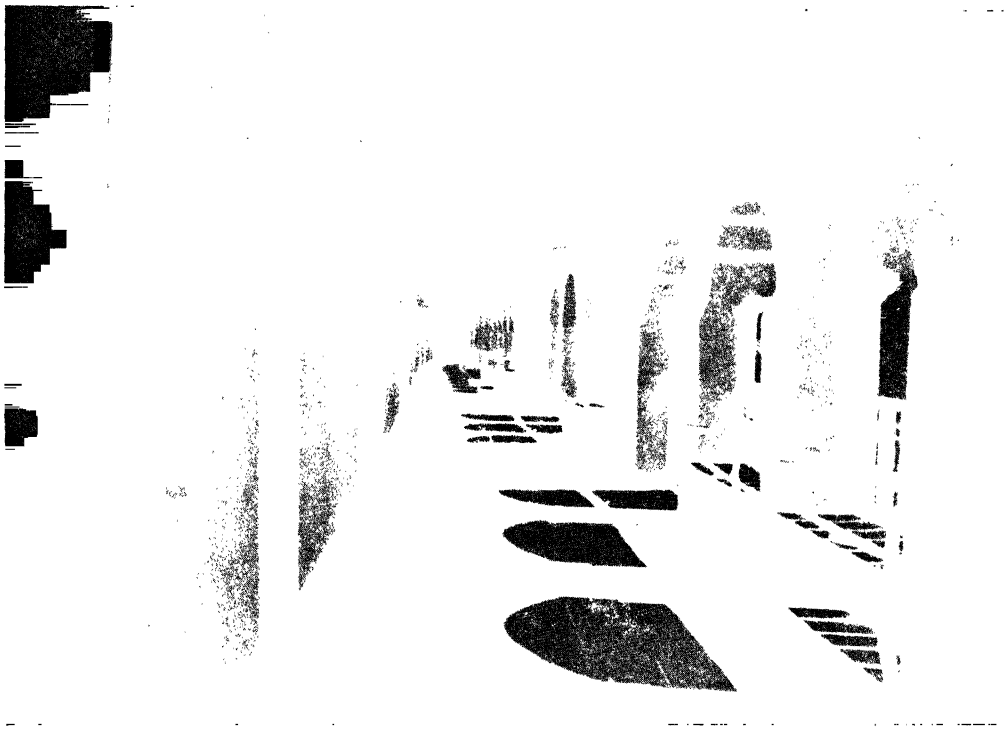
"When the representatives finally dismounted from their gaily caparisoned mules there was a universal embracing, while the white-kilted escort burned more powder. Then, as the fathers entered the court, the bells of the clock tower pealed their welcome" (see text, page 267).

and stony a road was never meant for wheels — led us almost all the way through lonely woods that were just beginning to be aware of spring, first slanting up the steep backbone of the peninsula and giving us romantic views of the Ægean and certain gray monastery towers at its edge; then winding down a long amphitheatrical slope to the bay, where Vatopéthi stood like a medieval castle.

Its distant air of grimness changed as we came down through the olive yards compassing it about. Windows pierced the upper part of the massive stone walls and high balconies leaned out on curved wooden corbels. Substantial outbuildings were scattered picturesquely among trees, their old slate roofs tinged with yellow lichen and tipped with crosses. The gay mountain water flashed past us in orderly little stone canals. The very mules we met had an air of mildness, well-being, and dignified superiority to their bony brethren from Karyés, which was not unnatural of mules belonging to one of the oldest, largest, richest, and most interesting monasteries on Mt. Athos.

Before the great gate, on an irregular stone bridge above a noisy mill-race, stood a cupola which shelters an icon of the Virgin. Here all who pass in or out stop and cross themselves; and here the gate-keeper shook hands with us, took our circular letter, and reverently kissed its seal. Then we were inducted through a vaulted passage guarded by two more massive gates into the interior court of the monastery.

I could have spent the rest of the afternoon in this wide irregular sloping place, overlooked by open galleries, where a domed church, a white bell-tower, and sundry smaller buildings were set down at random among orange and poplar trees. But we were shown up an outside stair, roofed with slate, to the guest-house. The old gentleman in charge thereof, in a rusty black gown and a brown felt fool's-cap, made us welcome in his own room, served us the refreshments of rigor, and finally took us to a



Photograph by H. G. Dwight

A CLOISTER AT VATOPÉTHI: MT. ATHOS, GREECE

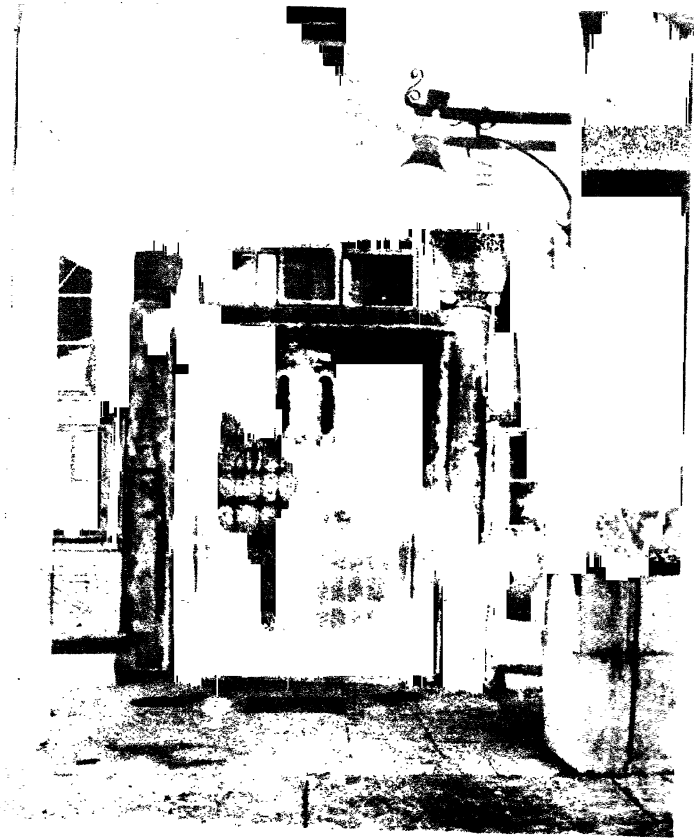
"The cells of the monks are big, clean, bare apartments, furnished chiefly with endless sofas. There they lead a sort of family life, each elder keeping house with one or more spiritual sons" (see text, page 263).

wide marble corridor—with a delightful balcony at the end—out of which opened the guest-rooms of state.

EATING THE OCTOPUS

We owed it to the size and prosperity of Vatopéthi that ours was furnished *alla franca*. It contained, that is, two iron beds arranged like sofas, a monumental stove of brick and plaster, and an electric bell. Toilet arrangements it had none, these being situated in the hall outside and consisting of a tap set over a small marble basin without a stopper. The room had, however, a very superior view across a sluice of quick water, an orange garden, and a collection of lichened roofs, to the blue bay. And in it, shortly after sundown, we were served to such a meal as an orthodox monastery may provide during Lent. We lived to learn, sooner or later, how to thrive on snails.

This time, however, the piece of resistance was a stew of octopus. That toothsome creature, being bloodless, escapes the ban which bars out fish and flesh, not to mention eggs, milk, butter, and oil. We also had a vegetable soup, a mixture of leeks and rice, salad, good black bread, a heavenly compound of caviar, lemon, parsley, and—can I believe that mere elbow grease completed that Lenten substitute for butter?—and more of the famous red wine of the peninsula than we could drink. The old gentleman, the two novices under him, and the cook waited on us, always entering the room without knocking. We found that to be the general etiquette of Mt. Athos. The monks built us a comfortable fire, they smoked cigarettes with us after coffee, they asked us wonderful questions about our country, and they finally brought us thick quilts with a sheet sewn to one side of them, wherein to wrap ourselves for the night.





Photographs by H. G. Dwight

THE CHURCH DOOR AT VATOPÉTHI: MT. ATHOS, GREECE

The door is covered with engraved plates of brass, and before it hangs a heavy curtain of what must have been an earlier portiere. Covel says: "Before the entrance into the *Narthex* hang'd a very rich embroydered Antiport, given by Andronicus."

THE INNER NORTHEX OF THE CHURCH OF VATOPÉTHI: MT. ATHOS, GREECE

This ancient building was first constructed in the tenth or eleventh century. Its interior is completely decorated with frescoes first painted in 1312, but unfortunately restored in 1739. The Adrianopolitan founders of the monastery are buried in a chapel opening out of the northex. Here, too, is to be seen almost the only example of mural mosaic on Mt. Athos—at the left of the door.

I spare the reader a chronicle of our successive risings up and lyings down at Vatopéthi. He may, however, be interested to hear of the way in which they were regulated. The first time I became conscious, in the watches of the night, of that all-pervasive hammering, I thought pirates must be upon us, as in days of old.

WHERE BELLS ARE TABOO

Then I remembered that Greek monks are called to prayer in a fashion of their own. Bells are not regarded with too much favor in the Levant. The fact that they are an innovation borrowed, albeit in the tenth century, from schismatic Venice makes the orthodox doubt their appeal, while the Turks object to them even more strongly, lest they disturb wandering spirits. For all ordinary purposes the monks use in their stead a hanging wooden plank, or sometimes a smaller metal bar, of which the necessary concomitant is a stout mallet. The rhythmic echo of these instruments is the most characteristic sound of Mt. Athos, the voice, as it were, of its loyalty to other times. Twice a day, or every eight hours during seasons of fasting, it calls the monks to church.

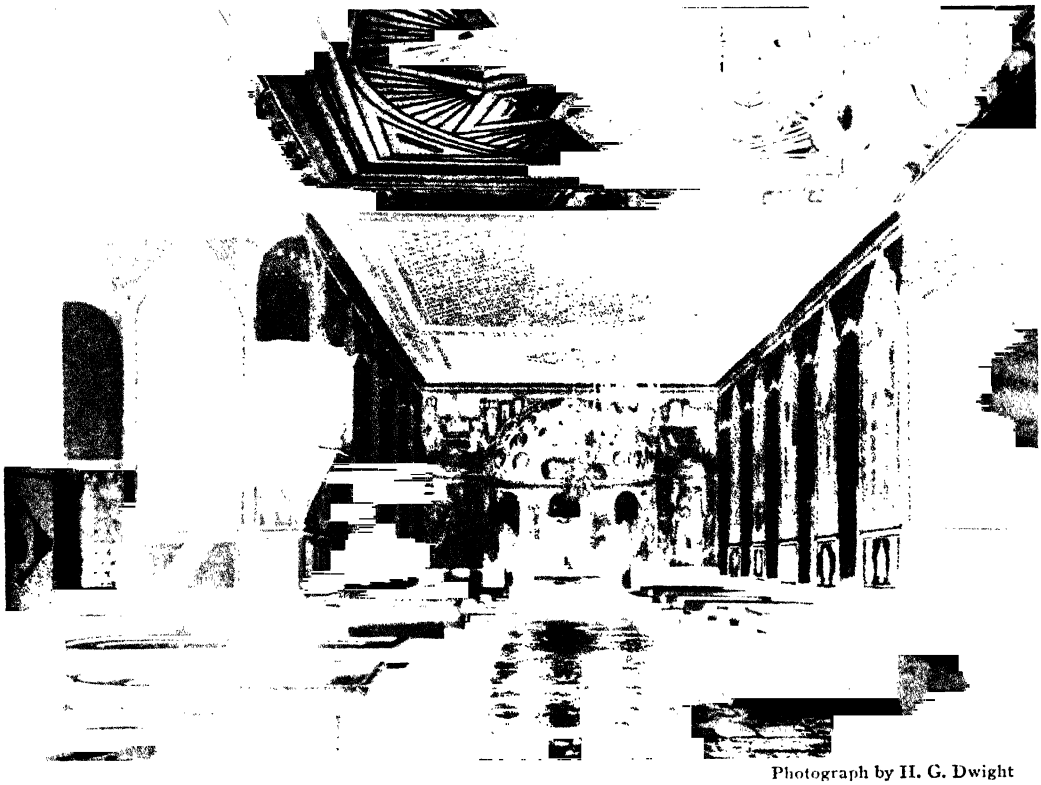
And the stranger within their gates divides his hours accordingly. His breakfast is ready, if he is not, at the close of the night service. Shall I add that we were a little dismayed to be presented, in lieu of this meal, with the inevitable tray? I must confess that I am not fond of a beefsteak breakfast, and that I have no scruple against a liqueur; but I don't care for it the first thing in the morning, with nothing to go with it but a spoonful of jam and a thimbleful of black coffee. We had to beg the astonished cook for a bite of bread, and to lay in a secret stock of chocolate from Karyés, in order to keep us going till lunch. This came early, either just before or just after the morning service, while dinner is always served at dark, to give the fathers time for a nap before the night office.



Photograph by H. G. Dwight

IN THE CHURCH OF VATOPÉTHI: MT. ATHOS, GREECE

In the rear is seen part of the richly carved and gilded screen which in a Greek church divides the altar from the chancel. The large icon at the right is one of the more highly prized treasures of the monastery, having been saved from the Church of St. Sophia in Saloniki just before that city was first captured by the Turks.



Photograph by H. G. Dwight

THE REFECTORY OF VATOPÉTHI: MT. ATHOS, GREECE

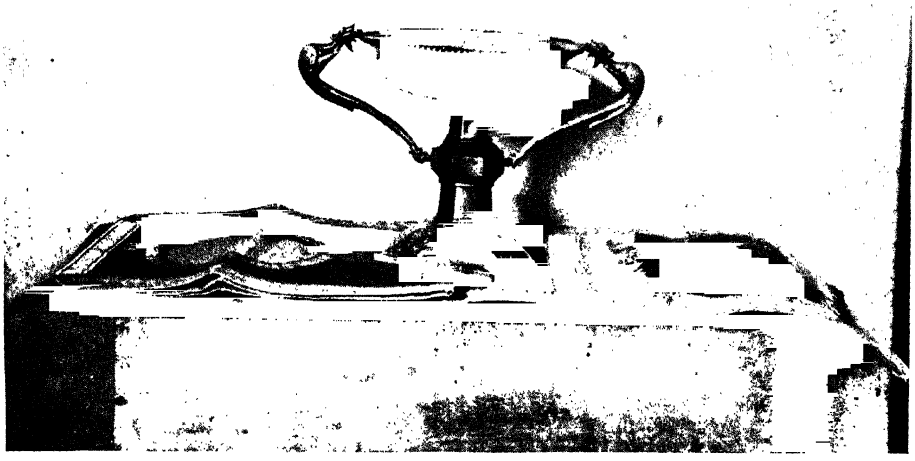
The story of the founding of Vatopéthi is to the effect that on a voyage from Rome to Constantinople the imperial trireme, having Arcadius, son of Theodosius, aboard, was caught in a storm, in which Arcadius fell into the sea. The next day the trireme made the bay of Vatopéthi, and there the boy was found asleep under the trees. Vatopéthi was built by Theodosius as a thank offering for his son's rescue.

MUCH LIBERTY PERMITTED

For the rest, the ascetic life did not strike us as being too severe at Vatopéthi. The Eastern church contains no such variety of religious orders as the Western, all Greek monks following the canon of St. Basil. They have a choice of two forms of government, however, the cenobite and the idiorrhythmic (each member permitted to regulate his own manner of life). Mt. Athos is almost equally divided between the two, and Vatopéthi is one of the second. There is no abbot, the government being in the hands of two or three *epítropi,* annually elected by the council of elders. The goods of the monastery are owned in common by the brothers, who live separately, according to their tastes or means, and are allowed considerable latitude in their religious observances. The cenobite monasteries, on the other hand, are governed by a hegumen elected for life, who controls the policy and property of the brothers. They occupy uniform cells, take their meals in refectory, are disciplined for not attending offices, and otherwise follow a more rigorous régime.

We took early occasion to pay our respects to the *epítropi,* being received by those grave and reverend signors with some state and asked questions not a few. They were kind enough to express the honor they felt in entertaining learned strangers, telling us that they had lately received with pleasure the visit of two hundred French lords, who had stopped at Vatopéthi in a white ship of their own.

When we said that six hundred American lords had recently visited Constan-



Photograph by H. G. Dwight

ONE OF THE SACRED RELICS OF VATOPÉTHI: MT. ATHOS, GREECE

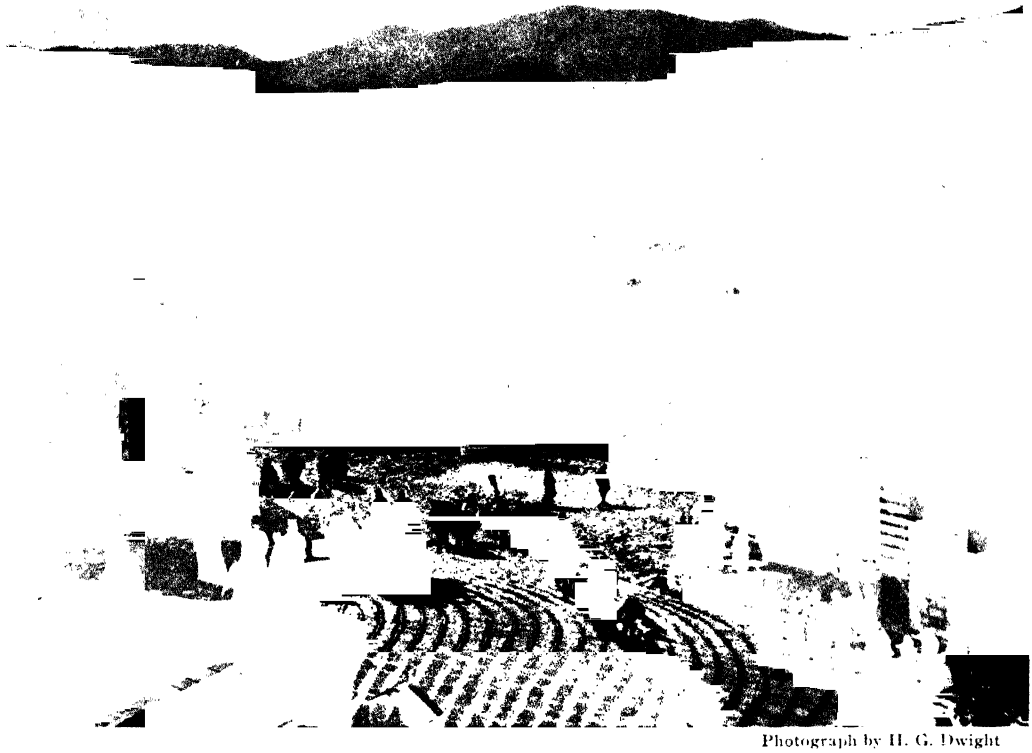
"Vatopéthi is extremely rich in relics and church treasures of all kinds. One of the most interesting of these is "a beautiful communion cup, of a reddish translucent stone, supported by two gold dragons, which was the gift of the Emperor Manuel II Polæologus" (see text, page 264).

tinople in a black ship, the fathers were filled with sorrow at having been passed by. That black ship, alas, will never cruise in the Levant again, for it was the *Arabic*, of recent unhappy renown. We also had opportunity, through the friendliness of the monks, to see how some of them lived—in big, clean, bare apartments, furnished chiefly with endless sofas. There they lead a sort of family life, each elder keeping house with one or more spiritual sons—younger monks, novices, and boys devoted by their families to the monastic life—maintaining them and sometimes even sending them away to school.

HAD HE MOMENTS OF REGRET?

We had the good fortune to become especially well acquainted with two such members of "families." One of them was the assistant librarian, and the other the keeper of the bema and of the precious furniture of the church. The latter took the more trouble for us because he had a brother in New York. Both peasants by birth, for whom Mt. Athos probably represented a rise in the social and intellectual scale, they had come as young boys to Vatopéthi. The latter, in particular, made me wonder if he ever had moments of regret. He was a powerful young islander of the Marmora whom one could more easily imagine in a uniform than in monastic skirts. But the only trace of bitterness I found in him was when he spoke of his lack of learning. Promised an education by his "father," he had been kept year after year in the service of the church—I suspected on account of his good looks and good voice—until it was too late for him to go to school.

Thanks to our acquaintance with this very kind and intelligent monk, we were free to prowl about the church at our leisure. I might speculate with an air of erudition—cribbed from French and German Byzantinists—about the date of this cruciform structure, the character of its domes, the period of its frescoes, and I know not how many other exact and intricate points of archæology. For myself, however, I was rather pleased that the fathers, always a little romantic about their own chronicles, assured us that it was reared by the emperor Theodosius the Great, whose son Arcadius they al-



Photograph by H. G. Dwight

THE ARRIVAL OF THE PARLIAMENT OF KARYÉS AT VATOPÉTHI TO CELEBRATE THE FEAST OF THE ANNUNCIATION OF THE VIRGIN: MT. ATHOS, GREECE

leged to have been shipwrecked as a boy in their bay—some six hundred years before Vatapéthi was founded.

THE DIGNITY AND SPLENDOR OF BYZANTINE CHURCHES

And I took no less pleasure in the frescoes because the monks have a trick of touching them up whenever they begin to look rusty. The whole interior of the church might have been painted by an early Tuscan with a decorative sense and a certain dark nobility that you do not always see in Florence or Siena. These frescoes, with the great carved and gilded altar screen, the tessellated marble floor unencumbered by seats, the carved stalls, the rich shrines, the innumerable icons, the shining lamps and candelabra, reproduce more completely than can now be seen elsewhere the dignity and splendor of a Byzantine church.

The illusion of the past is the more perfect at Vatopéthi, because it contains so many treasures identified with the pious princes of the East. In the body of the church are a throne inlaid with ivory and a beautifully chased silver icon of Andronicus II Palæologus. Among the smaller and more precious objects preserved in the bema are a fragment of the True Cross, set in gold and studded with big pale stones, in an ancient gold case, with engraved compartments for the blood of saints, presented by that King Lazar of the Serbs who was beheaded in 1389 on the field of Kossova by Sultan Mourad I, himself dying of a dagger-thrust inflicted by a Serbian prisoner.

We were also shown a beautiful communion cup, of a reddish translucent stone, supported by two gold dragons, which was the gift of the Emperor Manuel II Palæologus; and two icons of exceedingly fine mosaic, in repoussé silver-gilt frames, attributed to an imperial lady of the name of Theodora. Since Vato-



Photograph by H. G. Dwight

THE FEAST OF THE ANNUNCIATION AT VATOPÉTHI MONASTERY: MT. ATHOS, GREECE

A crowd of pilgrims, monks, and hermits from all parts of the peninsula attends this feast. Huge caldrons of rice and other food are prepared for them, and they are served in the courtyard, seated in long rows on the flagstones.

péthi did not exist at the time the consort of Justinian was passing through her checkered career, those saintly objects perhaps came from the last of the Macedonian dynasty, sister to that famous Empress Zoe, who, having spent the greater part of 48 irreproachable years as a nun, suddenly blossomed forth on the throne into excesses that astonished even Constantinople.

THE GIRDLE OF THE VIRGIN

The relic which Vatopéthi cherishes most tenderly is the girdle of the Virgin Mary. Our friend, the assistant librarian, gave us the entire history of it, from its presentation by the Queen of Heaven to doubting Thomas until its recovery during the Greek revolution from a European consul, to whom the Turks had sold it. If the earlier stages of the story are involved in some obscurity, the last six or seven hundred years of it are unquestionable. The girdle has now been divided into three parts, one of which is never allowed to leave Vatopéthi. It occupies a little domed chapel in the courtyard. The other two parts often go out on tour, especially when invited by the faithful; and many are the miracles reported to have been performed by them. The assistant librarian himself had recently returned from such a tour, when he and an older monk traveled for nine months in Thrace and Macedonia with the sacred relic, bringing back some 14,000 francs for the monastery.

I fear I was profane enough to take a deeper interest in certain other treasures the assistant librarian showed us. These were opened, on top of a tower at an angle of the sea-façade, by an old librarian with a beard so long and so white that he might have walked out of a By-



Photograph by H. G. Dwight

THE SEA TOWER OF SIMÓPETRA: MT. ATHOS, GREECE

The monastery to which this tower belongs is romantically situated on a crag a thousand feet above the Ægean

zantine fresco. From the ceremony with which this visit was invested and the slowness with which the huge library key turned in its wards, I seemed to gather an impression only strengthened by subsequent experiences. The librarian of another monastery was also its representative at Karyés, and he had to be brought down from the capital by express mule before we could see his books.

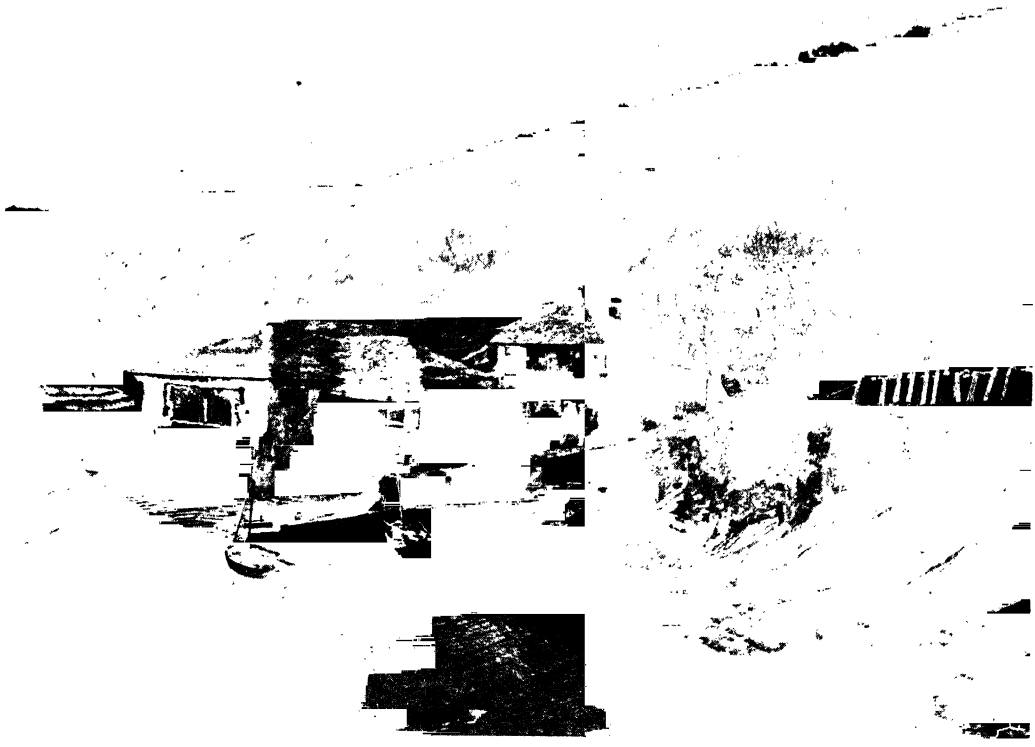
ILLUMINATED MANUSCRIPTS BADLY HANDLED

A third library was unlocked by three several keys, whose holders had been collected from as many points of the compass. At a fourth monastery I asked one of the presiding elders if they had any illuminated manuscripts. He said he did not know; he had never been into the library. And we felt an air of mistrust about us whenever we asked to see books. Sometimes we were not allowed to touch them ourselves. It was the more exasperating, because a dreadful habit is almost universal on Mt. Athos of turning rare vellum pages by pinching them up between a licked, but not too clean, thumb and forefinger.

Yet we saw holes enough cut in pages where illuminations had been to realize that the monks are not suspicious without reason. Nor have all collectors, I fear, been so scrupulous to make return for the spoil they have carried away as that spirited and human traveler, the Hon. Robert Curzon, Jr., who visited the Sacred Mount in 1837, bought a shipload of precious manuscripts, and in his "Visits to Monasteries in the Levant" wrote an account of his adventures that I, for one, infinitely prefer to "Eothen."

A MYSTIFYING MAP OF MACEDONIA

At Vatopéthi they luckily refused to sell him anything. The consequence is that they have today a very rich collection of medieval books. One of the most



Photograph by H. G. Dwight

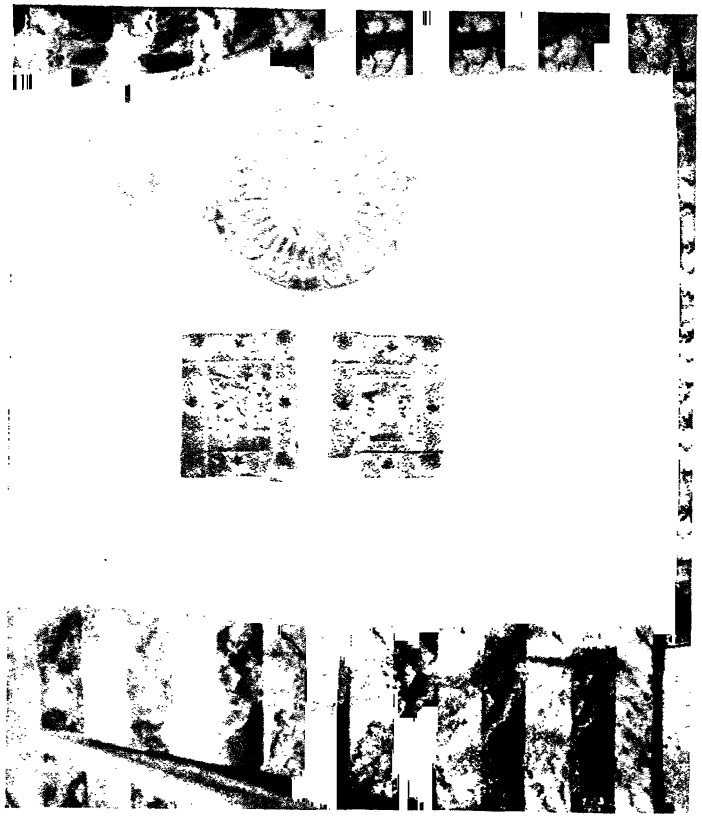
THE PORT OF LAVRA: MT. ATHOS, GREECE

curious is a geography of the eleventh century, after Strabo and Ptolemy, containing the most extraordinary maps. I photographed one of Macedonia, out of which no human being could make head or tail; and on top of it I carefully proceeded to photograph a beautifully illuminated liturgy of St. Basil.

We prolonged our stay at Vatopéthi, at the kind instance of the monks, in order to see a characteristic piece of local color. This was the fête day of the monastery, which is dedicated to the Annunciation of the Virgin. The festival was celebrated with the more enthusiasm, I fancy, because it happened to fall in Lent. From all parts of the peninsula, and even from farther away, guests gathered in honor of one of the chief distractions of the Mt. Athos year.

The Parliament of Karyés, especially invited, arrived in a body the day before the fête. Their approach was heralded by gunshots among the hills, at which signal the elders of the monastery assembled at the gate. When the representatives finally dismounted from their gaily caparisoned mules, there was a universal embracing, while the white-kilted escort burned more powder. Then, as the fathers entered the court, the bells of the clock-tower pealed them welcome, and they all went into the church for a brief office.

The religious event of the occasion was the vigil in the church, which began before sundown on the eve of the great day. We found the two narthexes and the nave packed with monks and peasants, all standing, as the Greek custom is. Six tall white guardsmen picturesquely kept the transepts clear. We had the honor to be shown to transept stalls, among the higher clergy and invited guests; but, although this honor conferred the privilege of hanging by one's elbows from the high arms of one's stall, even of perching on a little shelf adjusted to the edge of a turned-up seat which it is not etiquette to use, I must confess that I weakly withdrew before midnight.





Photographs by H. G. Dwight

A GOSPEL BOUND IN BEATEN GOLD AND A JADE COMMUNION CUP BELONGING TO THE MONASTERY OF XIROPÓTAMO: MT. ATHOS, GREECE

Local tradition ascribes the foundation of this monastery to the Virgin Empress Pulcheria, who reigned in Constantinople in the fifth century. Profaner annals attribute it to the fourteenth century, but the cup of this illustration, beautifully cut out of jade, bears an inscription of the Empress Pulcheria, and it may well be a veritable relic of that older time.

FRESCO REPRESENTING THE TEMPTATION OF ST. ANTHONY, IN THE CHURCH OF THE SKITI, OF KAVSOKALYVIA: MT. ATHOS, GREECE

A *skiti* is an industrial community living under monastic rule and dependent upon a monastery. This *skiti* is composed of painters and wood-carvers, affiliated with the monastery of Lavra.

STILL CHANTING AT 4 A. M.

My friend, the assistant librarian, kindly saw to it that I did not miss the climax of the ceremony. It was strange, at 4 o'clock in the morning, to come out of the cool starlight of the court into the heat and press and splendor of the church, to find the good fathers chanting on as I had left them, as monks had chanted before them for a thousand years. The responses passed from transept to transept in the antique Byzantine monotone.

First at one lectern and then at the other a young deacon intoned from an illuminated missal. His pale, serious face and the red glint in the hair waving about his shoulders made me think of a Giorgione. Others, in magnificent brocades, swinging censers, came and went. The officiating bishop, an old man bowed down by his jeweled miter and his cloth-of-gold vestments, sat on a carved and gilded throne, holding an emerald cross in one hand and in the other a tall gold crozier. And lights were everywhere—in brass and silver candalabra, in a fantastic silver tree bearing oranges of gold, in votive lamps and chandeliers before dim images, and in the great brass coronal, with its double-headed eagles of Byzantium, swinging from the central dome.



Photograph by H. G. Dwight

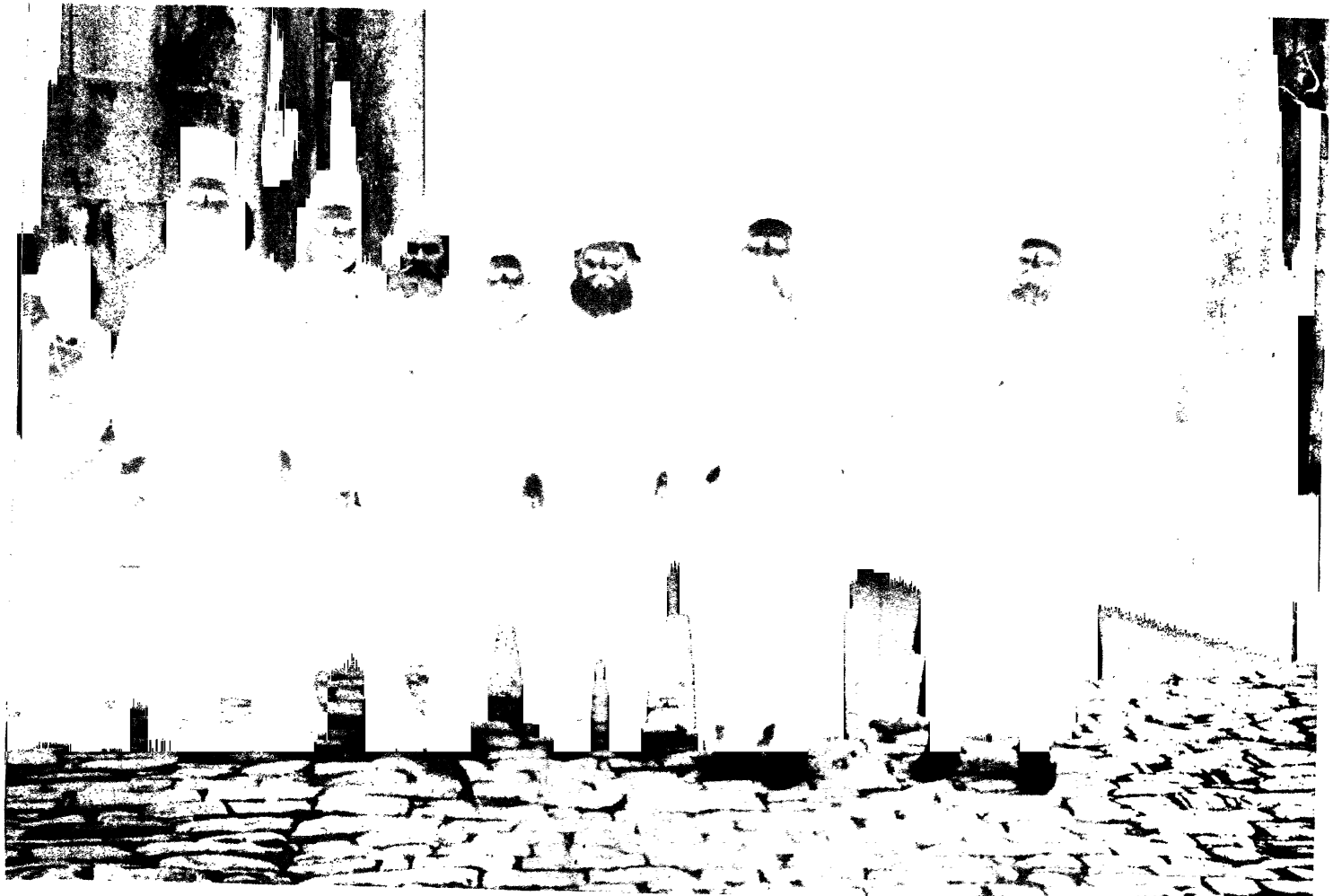
THE PHIATE OR FONT OF LAVRA: MT. ATHOS, GREECE

This beautiful and interesting church fountain stands in front of the monastery Church of Lavra. The *phiate* was originally built in 1060, although the brickwork of the present structure dates from the sixteenth or seventeenth century. But the fountain itself and the marble panels surrounding it are, no doubt, original. The fountain built in Constantinople by Emperor William II, in commemoration of his two visits to Sultan Abd-ül-Hamid, was inspired by this Byzantine design.

The focus of the ceremony was an ancient icon of the Virgin. It stood on a sort of easel draped with rich stuffs, under a parasol of flowered white brocade. As the office proceeded, the breast of the figure was hung with old Byzantine jewelry and strings of gold coins. Among them I afterward saw a Roman stater, two beautiful Alexanders, and any number of Venetian ducats and besants of Constantinople.

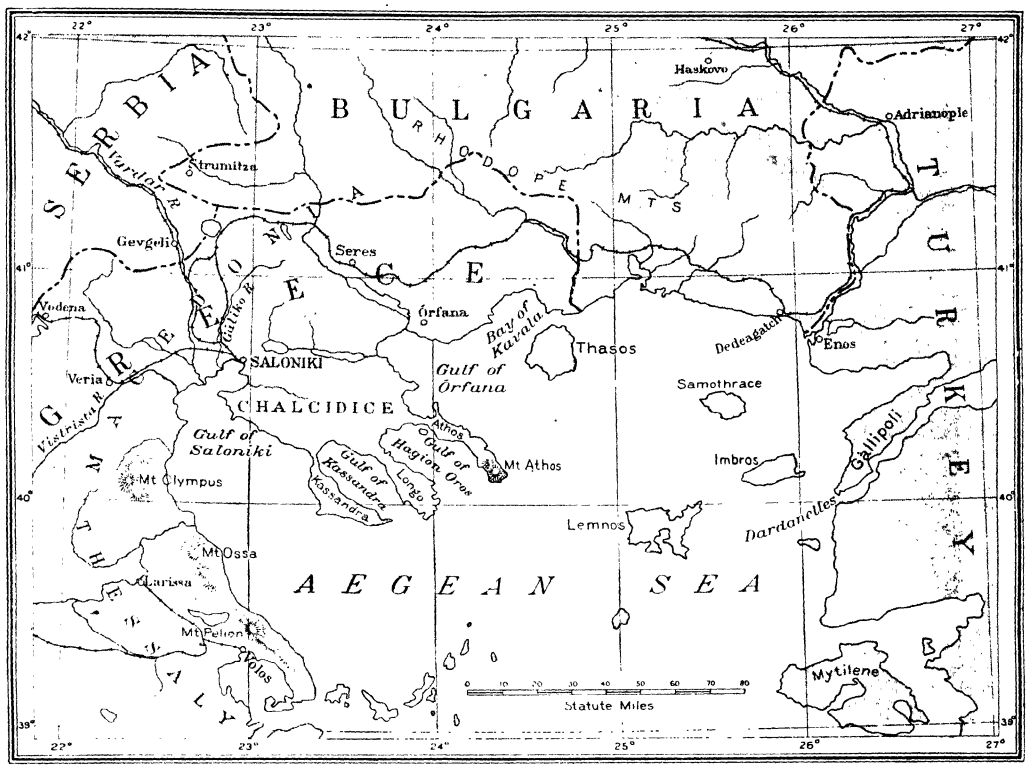
BLESSING THE BARLEY CAKE

At sunrise the Virgin was divested of her more precious finery and carried out of the church under her parasol. Pre-



MONKS AND LAYMEN OF MT. ATHOS, GREECE

Photograph by H. G. Dwight



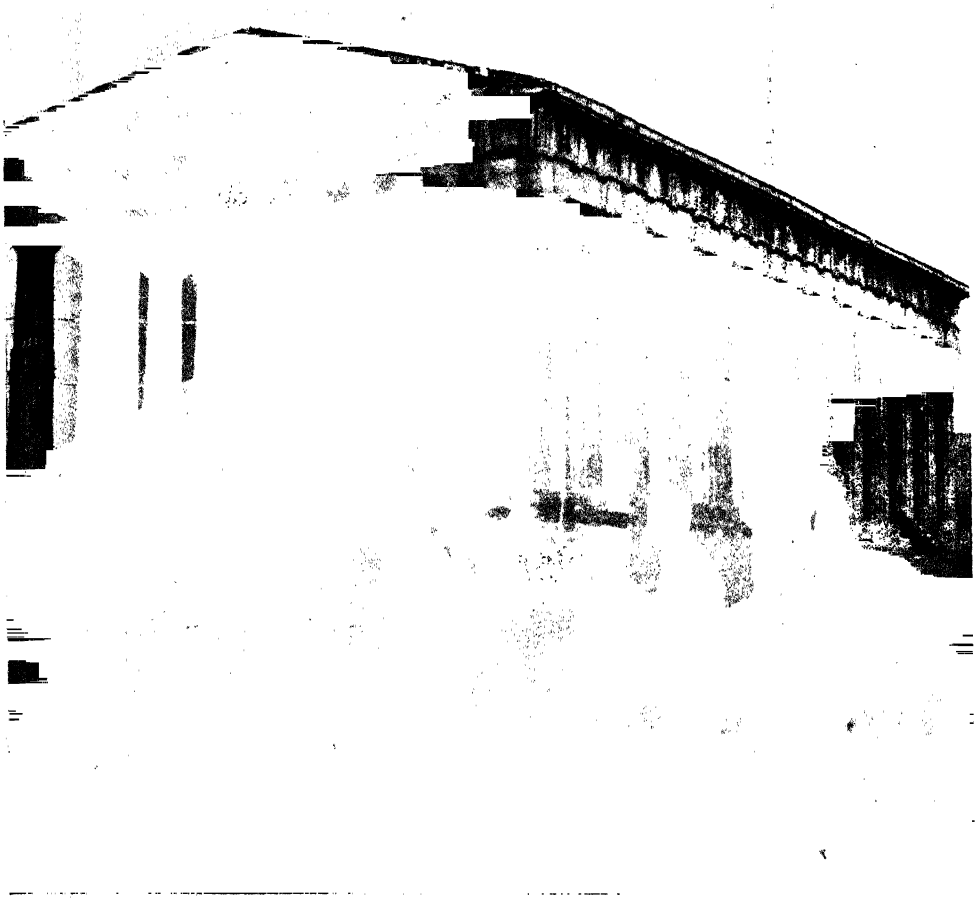
OUTLINE MAP OF SALONIKI AND ADJACENT COUNTRIES

ceded by banners and gilded lanterns on staves, escorted by a motley retinue of monks and peasants, she made the circuit of the monastery, without the walls, while the bells jingled and the bearded guardsmen shot off their pistols like boys into the early sunlight. At the return of the procession the liturgy was celebrated. Picturesque details of it, peculiar to the day, were the progress through the church of twelve sacred relics, each borne by a priest in gorgeous vestments, and the bringing in by guardsmen and blessing of two huge barley cakes frosted with sugar and colored candies. Then those present, in hierarchic order, crossed and prostrated themselves before the parasoled icon, after which the communion was administered, the barley cakes were cut, and the vigil of the Annunciation, 15 hours long, came to an end.

I did not wonder at the speed with which the church emptied itself into the refectory. This interesting cruciform structure, frescoed like the church and furnished with tables of one rough slab of marble, is now used only on such occasions. Guests of the humbler sort overflowed into the court, where they were served in long rows on the flagstones.

The higher dignitaries soon withdrew to the apartments of the *epítropi*. They sat down to a more elaborate banquet there at nightfall. Fish of many kinds, prepared in many ways, made up the chief feature of the menu—an exception allowable on this one day of Lent. While the black-gowned guests enjoyed this respite from the rigors of their long fast, they were entertained by the more famous choristers of the peninsula. After each had displayed his proficiency in the Byzantine chant, the Elders poured him out a glass of wine and dropped a napoleon into it.

I must not forget, however, the fair that established itself at the monastery gate, where the general effect of color and costume was more notable than the



THE BEST-PRESERVED GREEK TEMPLE IN THE WORLD, THE THESEUM : ATHENS, GREECE

objects offered for sale. And there was one more office in the church, to which I fear I would not have gone if a kind father had not hunted me up. The Virgin under her parasol, the silver orange tree, and other precious furniture had disappeared. The afternoon sun streamed through the high transept windows, bringing out the pattern of the marble floor, the rich carving of the altar screen, details of the pictured walls.

THE NIGHT-LONG VIGIL'S END

It brought out, too, the faces of the fathers under their black veils, worn and haggard after the night-long vigil. At a moment of the office one after another lighted a wax candle from that of his neighbor. The two semicircles twinkled pallidly enough at each other across the sun-touched splendor of the church. The incense, that had been so heady the night before, somehow missed its effect, like the candles. A swallow flashed across the opposite window.

I thought of the green hill I had climbed that afternoon, blossoming with asphodel, and how the sea looked through the leaning olive trees. I wondered what the fathers thought, chanting so gravely in the spring afternoon—if they, too, saw hills, or seas, or faces other than haggard ones under black monastic veils. With the sound of their chant an unsanctified crooning of pigeons suddenly began to mingle from the court without.

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THE NATIONAL GEOGRAPHIC MAGAZINE

THE LARGER NORTH AMERICAN MAMMALS

BY E. W. NELSON

ASSISTANT CHIEF, U. S. BIOLOGICAL SURVEY

With illustrations from paintings by Louis Agassiz Fuertes

Readers of THE GEOGRAPHIC *will be glad to learn that this number is the forerunner of another by Messrs. Nelson and Fuertes to be devoted to the portrayal and study of the smaller mammals of our continent. So great is the potential as well as the practical value along educational lines of this remarkable series of animal studies that* THE GEOGRAPHIC *has not hesitated to expend $40,000 in its publication. We congratulate our readers who have made such an achievement possible by their enthusiastic interest and support.*

AT THE time of its discovery and occupation by Europeans, North America and the bordering seas teemed with an almost incredible profusion of large mammalian life. The hordes of game animals which roamed the primeval forests and plains of this continent were the marvel of early explorers and have been equaled in historic times only in Africa.

Even beyond the limit of trees, on the desolate Arctic barrens, vast herds containing hundreds of thousands of caribou drifted from one feeding ground to another, sharing their range with numberless smaller companies of musk-oxen. Despite the dwarfed and scanty vegetation of this bleak region, the fierce winter storms and long arctic nights, and the harrying by packs of white wolves, these hardy animals continued to hold their own until the fatal influence of civilized man was thrown against them.

Southward from the Arctic barrens, in the neighboring forests of spruce, tamarack, birches, and aspens, were multitudes of woodland caribou and moose. Still farther south, in the superb forests of eastern North America, and ranging thence over the limitless open plains of the West, were untold millions of buffalo, elk, and white-tailed deer, with the prong-horned antelope replacing the white-tails on the western plains.

With this profusion of large game, which afforded a superabundance of food, there was a corresponding abundance of large carnivores, as wolves, coyotes, black and grizzly bears, mountain lions, and lynxes. Black bears were everywhere except on the open plains, and numerous species of grizzlies occupied all the mountainous western part of the continent.

Fur-bearers, including beavers, musk-rats, land-otters, sea-otters, fishers, martens, minks, foxes, and others, were so plentiful in the New World that immediately after the colonization of the United States and Canada a large part of the world's supply of furs was obtained here.

Trade with the Indians laid the foundations of many fortunes, and later devel-



Photograph by Capt. F. L. Kleinschmidt

TOWING HER BABY TO SAFETY

When a mother polar bear scents danger she jumps into the water and her cub holds fast to her tail while she tows it to safety. But when no danger seems to threaten she wants it to "paddle its own canoe," and boxes its ears or ducks its head under water if it insists on being too lazy to swim for itself.

oped almost imperial organizations, like the Hudson's Bay Company and its rivals. Many adventurous white men became trappers and traders, and through their energy, and the rivalry of the trading companies, we owe much of the first exploration of the northwestern and northern wilderness. The stockaded fur-trading stations were the outposts of civilization across the continent to the shores of Oregon and north to the Arctic coast. At the same time the presence of the sea-otter brought the Russians to occupy the Aleutian Islands, Sitka, and even northern California.

The wealth of mammal life in the seas along the shores of North America almost equaled that on the land. On the east coast there were many millions of harp and hooded seals and walruses, while the Greenland right and other whales were extremely abundant. On the west coast were millions of fur seals, sea-lions, sea-elephants, and walruses, with an equal abundance of whales and hundreds of thousands of sea otters.

Many of the chroniclers dealing with explorations and life on the frontier during the early period of the occupation of America gave interesting details concerning the game animals. Allouez says that in 1680, between Lake Erie and Lake



Photograph by Capt. F. E. Kleinschmidt

A SWIMMING POLAR BEAR

A polar bear when swimming does not use his hind legs, a new fact brought out by the motion-picture camera



FUR SEAL: FEMALES AND YOUNG PUPS

Photograph by Roy Chapman Andrews

From the ages of one to four years fur seals are extremely playful. They are marvelous swimmers, and frolic about in pursuit of one another, now diving deep, and then, one after the other, suddenly leaping high above the surface in graceful curves, like porpoises.



© Keystone View Co.

ROAMING "MONARCHS OF THE PLAIN": BRITISH COLUMBIA

A remnant of the veritable sea of wild life that surged over American soil before the dikes of civilization compassed it about and all but wiped it out

Michigan the prairies were filled with an incredible number of bears, wapiti, white-tailed deer, and turkeys, on which the wolves made fierce war. He adds that on a number of occasions this game was so little wild that it was necessary to fire shots to protect the party from it. Perrot states that during the winter of 1670-1671, 2,400 moose were snared on the Great Manitoulin Island, at the head of Lake Huron. Other travelers, even down to the last century, give similar accounts of the abundance of game.

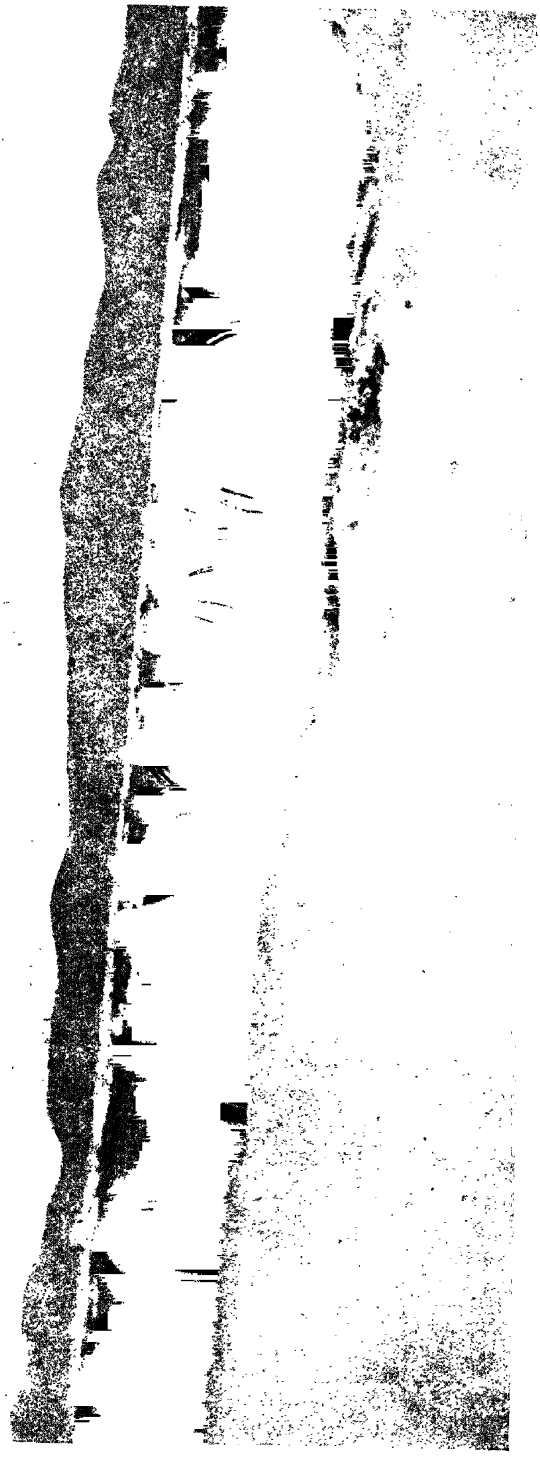
TRAINS HELD UP BY BUFFALO

The original buffalo herds have been estimated to have contained from 30,000,000 to 60,000,000 animals, and in 1870 it was estimated that about 5,500,000 still survived. A number of men now living were privileged to see some of the great herds of the West before they were finally destroyed. Dr. George Bird Grinnell writes:

"In 1870, I happened to be on a train that was stopped for three hours to let a herd of buffalo pass. We supposed they would soon pass by, but they kept coming. On a number of occasions in earlier days the engineers thought that they could run through the herds, and that, seeing the locomotive, the buffalo would stop or turn aside; but after a few locomotives had been ditched by the animals the engineers got in the way of respecting the buffaloes' idiosyncrasies. . . .

"Up to within a few years, in northern Montana and southern Alberta, old buffalo trails have been very readily traceable by the eye, even as one passed on a railroad train. These trails, fertilized by the buffalo and deeply cut so as to long hold moisture, may still be seen in summer as green lines winding up and down the hills to and from the water-courses."

Concerning the former abundance of antelope, Dr. Grinnell says: "For many years I have held the opinion that in early days on the plains, as I saw them, antelope were much more abundant than buffalo. Buffalo, of course, being big and black, were impressive if seen in masses and were visible a long way off. Antelope, smaller and less conspicuous in color, were often passed unnoticed, except by a person of experience, who



Photograph by E. E. Kleinschmidt

A WALRUS BATTLE FRONT: THOUGH FORMIDABLE LOOKING, WITH THEIR LONG TUSKS, THEY ASK ONLY TO BE LET ALONE

might recognize that distant white dots might be antelope and not buffalo bones or puff balls. I used to talk on this subject with men who were on the plains in the '60's and '70's, and all agreed that, so far as their judgment went, there were more antelope than buffalo. Often the buffalo were bunched up into thick herds and gave the impression of vast numbers. The antelope were scattered, and, except in winter, when I have seen herds of thousands, they were pretty evenly distributed over the prairie.

ANTELOPES EVERYWHERE

"I have certain memories of travel on the plains, when for the whole long day one would pass a continual succession of small bands of antelope, numbering from ten to fifty or sixty, those at a little distance paying no attention to the traveler, while those nearer at hand loped lazily and unconcernedly out of the way. In the year 1879, in certain valleys in North Park, Colorado, I saw wonderful congregations of antelope. As far as we could see in any direction, all over the basins, there were antelope in small or considerable groups. In one of these places I examined with care the trails made by them, for this was the only place where I ever saw deeply worn antelope trails, which suggested the buffalo trails of the plains."

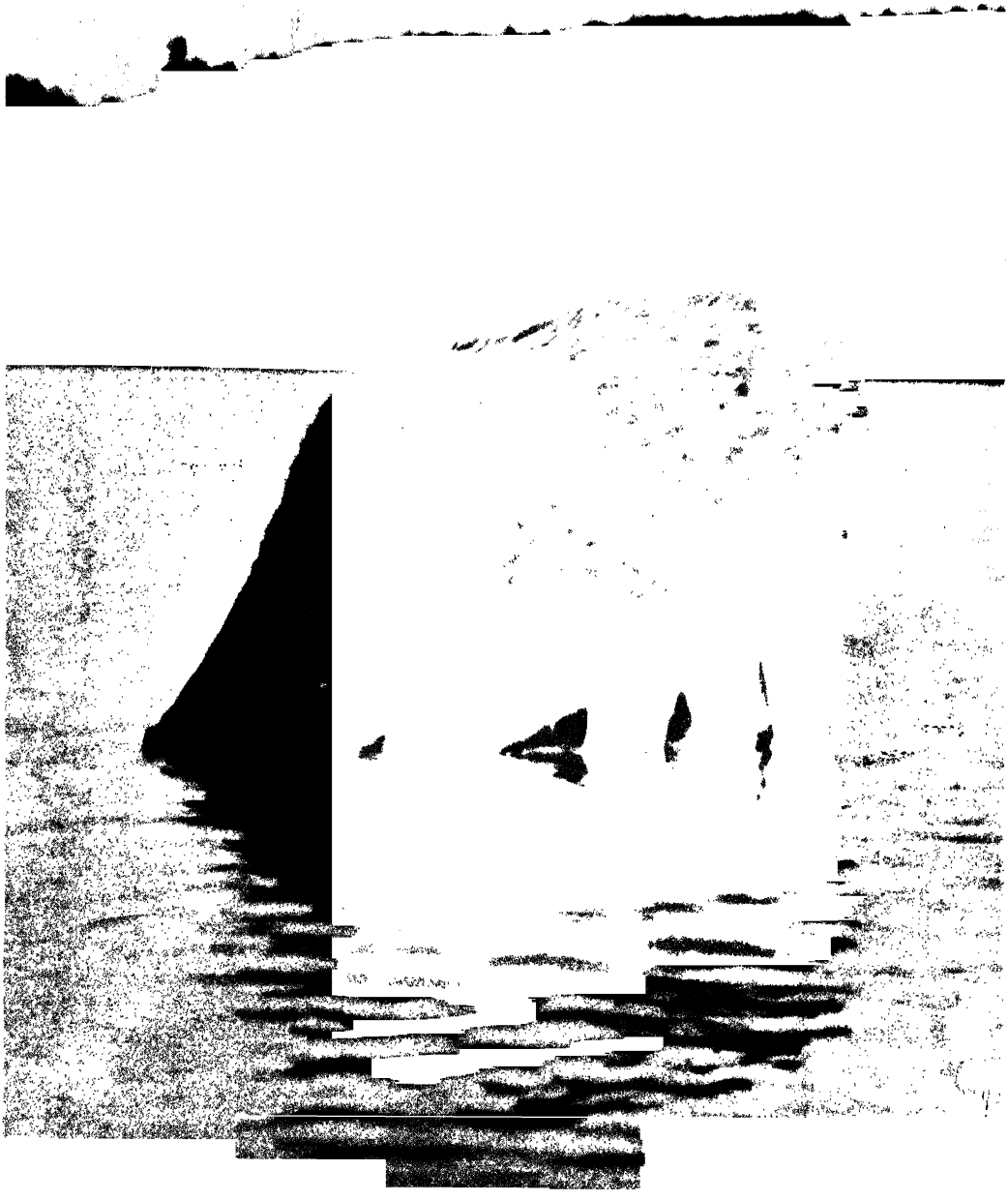
The wealth of animal life found by our forebears was one of the great natural resources of the New World. Although freely drawn upon from the first, the stock was but little depleted up to within a century. During the last one hundred years, however, the rapidly increasing occupation of the continent and other



Photograph by Albert Schlechten

A CINNAMON TREED: YELLOWSTONE NATIONAL PARK

Bruin for the most part is an inoffensive beast, with an impelling curiosity and such a taste for sweet things that he can eat pounds of honey and lick his chops for more



Photograph by E. C. Oberholtzer

MOOSE FEEDING UNDER DIFFICULTIES

The moose likes the succulent water plants it finds at the bottom of lakes and sluggish streams, and often when reaching for them becomes completely submerged



Photograph by E. C. Oberholtzer

COW MOOSE WITH HER YOUNG

Notice the fold of skin at her neck resembling a bell

causes, together with a steadily increasing commercial demand for animal products, have had an appalling effect. The buffalo, elk, and antelope are reduced to a pitiful fraction of their former countless numbers.

WANTON WASTE OF WILD LIFE

Practically all other large game has alarmingly decreased, and its extermination has been partly stayed only by the recent enforcement of protective laws. It is quite true that the presence of wild buffalo, for instance, in any region occupied for farming and stock-raising purposes is incompatible with such use. Thus the extermination of the bison as a denizen of our western plains was inevitable. The destruction, however, of these noble game animals by millions for their hides only furnishes a notable example of the wanton wastefulness which has heretofore largely characterized the handling of our wild life.

A like disregard for the future has been shown in the pursuit of the sea mammals. The whaling and sealing industries are very ancient, extending back for a thousand years or more; but the greatest and most ruthless destruction of the whales and seals has come within the last century, especially through the use of steamships and bomb-guns. Without adequate international protection, there is grave danger that the most valuable of these sea mammals will be exterminated. The fur seal and the sea-elephant, once so abundant on the coast of southern California, are nearly or quite gone, and the sea otter of the North Pacific is dangerously near extinction.

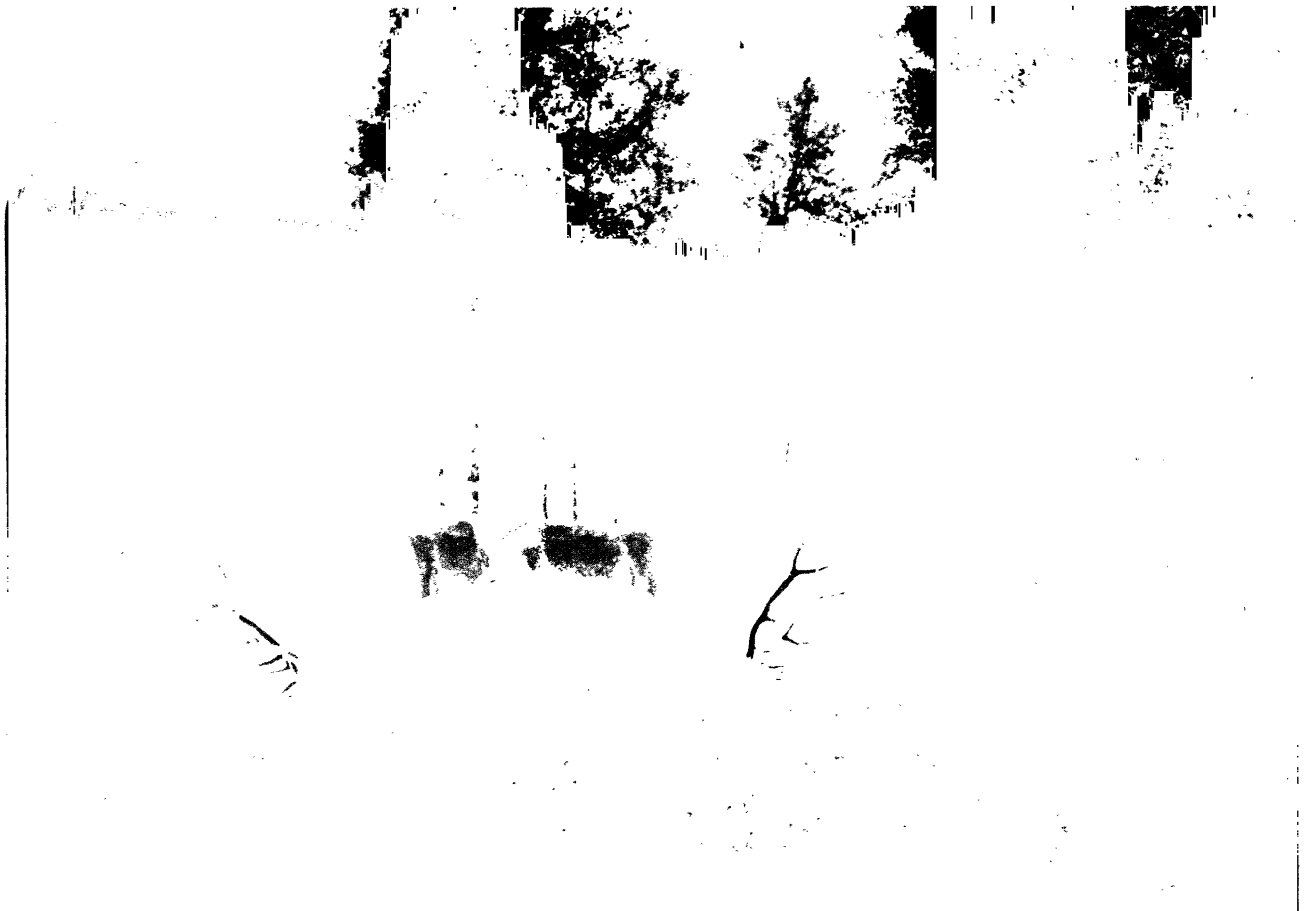
The recent great abundance of large land mammals in North America, both in individuals and species, is in striking contrast with their scarcity in South America, the difference evidently being due to the long isolation of the southern continent from other land-masses, whence it



Photograph by W. J. Stroud

ROCKY MOUNTAIN ELK

They can hold their own in the mountains in summer, but when the deep snows come they are compelled to go down into the valleys. Just before they leave the big bulls travel the mountains from one end to the other, driving old and young before them into the lower country. In case of a hard winter the elk are thin and weak, and then the dreaded wolf makes havoc among them, especially the little calves.



Photograph by W. J. Stroud

AN UNUSUAL ELK PICTURE



Photograph by Charles E. Johnson

THE MOOSE IS A POWERFUL SWIMMER



Photograph by F. O. Seabury

PART OF A HERD OF SIXTY MOUNTAIN SHEEP

They are fed hay and salt daily at the Denver and Rio Grande Railway station at Ouray, Colorado. This picture was taken at a distance of about 10 to 15 feet from the wild animals, which grow quite tame under such friendly ministrations.



From a drawing by Charles R. Knight

A MOOSE THAT LIVED IN NEW JERSEY IN PLEISTOCENE TIMES: CROMALCES

A primitive moose-like form, a nearly perfect skeleton of which was found in southern Jersey some years ago. In size and general proportions the animal was like a modern moose, but the nose was less developed, and the horns were decidedly different in character.

might have been restocked after the loss of a formerly existing fauna.

SPECIES COME AND SPECIES GO

The differences in the geographic distribution of mammal life between North and South America and the relationships between our fauna and that of the Old World are parts of the latest chapter of a wonderful story running back through geologic ages. The former chapters are recorded in the fossil beds of all the continents. While only a good beginning has been made in deciphering these records, enough has been done by the fascinating researches of Marsh, Cope, Osborn, Scott, and others to prove that in all parts of the earth one fauna has succeeded another in marvelous procession.

It has been shown also that these changes in animal life, accompanied by equal changes in plant life, have been largely brought about by variations in climate and by the uplifting and depressing of continental land-masses above or below the sea. The potency of climatic influence on animal life is so great that even a fauna of large mammals will be practically destroyed over a great area by a long-continued change of a comparatively few degrees (probably less than ten degrees Fahrenheit) in the mean daily temperatures.

The distribution of both recent and



Photograph by Gus A. Swanson

THEIR LIVING LIES BENEATH THE SNOW

All nature loves kindness and trusts the gentle hand. Contrast these sheep, ready to fly at the slightest noise, with those in the picture on page 396, peacefully feeding in close proximity to a standing express train. Every one appreciates a good picture of a living animal more than the trophy of a dead one!

fossil mammals shows conclusively that numberless species have spread from their original homes across land bridges to remote unoccupied regions, where they have become isolated as the bridges disappeared beneath the waves of the sea.

VAST NATURAL MUSEUMS OF EXTINCT ANIMAL LIFE

For ages Asia appears to have served as a vast and fecund nursery for new mammals from which North Temperate and Arctic America have been supplied. The last and comparatively recent land bridge, across which came the ancestors of our moose, elk, caribou, prong-horned antelope, mountain goats, mountain sheep, musk-oxen, bears, and many other mammals, was in the far Northwest, where Bering Straits now form a shallow channel only 28 miles wide separating Siberia from Alaska.

The fossil beds of the Great Plains and other parts of the West contain eloquent proofs of the richness and variety of mammal life on this continent at different periods in the past. Perhaps the most wonderful of all these ancient faunas was that revealed by the bones of birds and mammals which had been trapped in the asphalt pits recently discovered in the outskirts of Los Angeles, California. These bones show that prior to the arrival of the present fauna the plains of southern California swarmed with an astonishing wealth of strange birds and beasts (see page 401).

The most notable of these are saber-toothed tigers, lions much larger than those of Africa; giant wolves; several kinds of bears, including the huge cave bears, even larger than the gigantic brown bears of Alaska; large wild horses; camels; bison (unlike our buffalo); tiny antelope, the size of a fox; mastodons, mammoths with tusks 15 feet long; and giant ground sloths; in addition to many other species, large and small.



Photograph by L. Peterson

INTRODUCING A LITTLE BLACK BEAR TO A LITTLE BROWN BEAR AT SEWARD, ALASKA

"Howdy-do! I ain't got a bit of use for you!"
"What do I care! You'd better back away, black bear!"

With these amazing mammals were equally strange birds, including, among numerous birds of prey, a giant vulture-like species (far larger than any condor), peacocks, and many others.

DID MAN LIVE THEN?

The geologically recent existence of this now vanished fauna is evidenced by the presence in the asphalt pits of bones of the gray fox, the mountain lion, and close relatives of the bobcat and coyote, as well as the condor, which still frequent that region, and thus link the past with the present. The only traces of the ancient vegetation discovered in these asphalt pits are a pine and two species of juniper, which are members of the existing flora.

There is reason for believing that primitive man occupied California and other parts of the West during at least the latter part of the period when the fauna of the asphalt pits still flourished. Dr. C. Hart Merriam informs me that the folk-lore of the locally restricted California Indians contains detailed descriptions of a beast which is unmistakably a bison, probably the bison of the asphalt pits.

The discovery in these pits of the bones of a gigantic vulturelike bird of prey of far greater size than the condor is even more startling, since the folk-lore of the Eskimos and Indians of most of the tribes from Bering Straits to California and the Rocky Mountain region abound in tales of the "thunder-bird"—a gigantic bird of prey like a mighty eagle, capable of carrying away people in its talons. Two such coincidences suggest the possibility that the accounts of the bison and the "thunder-bird" are really based on the originals of the asphalt beds and have been passed down in legendary history through many thousands of years.

CAMELS AND HORSES ORIGINATED IN NORTH AMERICA

Among other marvels our fossil beds reveal the fact that both camels and horses originated in North America. The remains of many widely different species of both animals have been found



Photograph by Carl J. Lomen

A REINDEER HERD AT CAPE PRINCE OF WALES, ALASKA: MANY FAWNS ARE TO BE SEEN IN THE HERD, AS THIS PICTURE WAS TAKEN SHORTLY AFTER THE FAWNING SEASON

in numerous localities extending from coast to coast in the United States. Camels and horses, with many species of antelope closely related to still existing forms in Africa, abounded over a large part of this country up to the end of the geological age immediately preceding the present era.

Then through imperfectly understood changes of environment a tremendous mortality among the wild life took place and destroyed practically all of the splendid large mammals, which, however, have left their records in the asphalt pits of California and other fossil beds throughout the country. This original fauna was followed by an influx of other species which made up the fauna when America was discovered.

At the time of its discovery by Columbus this continent had only one domesticated mammal—the dog. In most instances the ancestors of the Indian dogs appear to have been the native coyotes or gray wolves, but the descriptions of some dogs found by early explorers indicate very different and unknown ancestry. Unfortunately these strange dogs became extinct at an early period, and thus left unsolvable the riddle of their origin.

Before the discovery of America the people of the Old World had domesticated cattle, horses, pigs, sheep, goats, dogs, and cats; but none of these domestic animals, except the dog, existed in America until brought from Europe by the invaders of the New World.

The wonderful fauna of the asphalt pits had vanished long before America was first colonized by white men, and had been replaced by another mainly from the Old World, less varied in character, but enormously abundant in individuals. Although so many North American mammals were derived from Asia, some came from South America, while others, as the raccoons, originated here.

FEWER LARGE MAMMALS IN THE TROPICS

It is notable that the fossil beds which prove the existence of an extraordinary abundance of large mammals in North America at various periods in the past, as well as the enormous aggregation of mammalian life which occupied this continent, both on land and at sea, at the time of its discovery, were confined to the Temperate and Arctic Zones. It is popu-



From Scott's "History of the Land Mammals of the Western Hemisphere": Macmillan Company

THIS REPRESENTS A SCENE AT THE CALIFORNIA ASPHALT PITS, WITH A MIRED ELEPHANT, TWO GIANT WOLVES, AND A SABER-TOOTHED TIGER (SEE PAGE 399)

larly believed that the tropics possess an exuberance of life beyond that of other climes, yet in no tropic lands or seas, except in parts of Africa and southern Asia, has there been developed such an abundance of large mammal life as these northern latitudes have repeatedly known.

In temperate and arctic lands such numbers of large mammals could exist only where the vegetation not only sufficed for summer needs, but retained its nourishing qualities through the winter. In the sea the vast numbers of seals, sea-lions, walruses, and whales of many kinds could be maintained only by a limitless profusion of fishes and other marine life.

From the earliest appearance of mammals on the globe to comparatively recent times one mammalian fauna has succeeded another in the regular sequence of evolution, man appearing late on the scene and being subject to the same natural influences as his mammalian kindred. During the last few centuries, however, through the development of agriculture, the invention of new methods of transportation, and of modern firearms, so-called civilized man has spread over and now dominates most parts of the earth.

As a result, aboriginal man and the large mammals of continental areas have been, or are being, swept away and replaced by civilized man and his domestic animals. Orderly evolution of the marvelously varied mammal life in a state of nature is thus being brought to an abrupt end. Henceforth fossil beds containing deposits of mammals caught in sink-holes, and formed by river and other floods in subarctic, temperate, and tropical parts of the earth, will contain more and more exclusively the bones of man and his domesticated horses, cattle, and sheep

DESTROYING THE IRRESTORABLE

The splendid mammals which possessed the earth until man interfered were the ultimate product of Nature working through the ages that have elapsed since the dawn of life. All of them show myriads of exquisite adaptations to their environment in color, form, organs, and habits. The wanton destruction of any



From a drawing by Charles R. Knight

A PRIMITIVE FOUR-TUSKED ELEPHANT, STANDING ABOUT SIX FEET AT THE SHOULDER, THAT LIVED AGES AGO IN THE UNITED STATES (TRICOPHODON MIOCENE)

of these species thus deprives the world of a marvelous organism which no human power can ever restore.

Fortunately, although it is too late to save many notable animals, the leading nations of the world are rapidly awakening to a proper appreciation of the value and significance of wild life. As a consequence, while the superb herds of game on the limitless plains will vanish, sportsmen and nature lovers, aided by those who appreciate the practical value of wild life as an asset, may work successfully to provide that the wild places shall not be left wholly untenanted.

Although Americans have been notably wasteful of wild life, even to the extermination of numerous species of birds and mammals, yet they are now leading the world in efforts to conserve what is left of the original fauna. No civilized people, with the exception of the South African Boers, have been such a nation of hunters as those of the United States. Most hunters have a keen appreciation of nature, and American sportsmen as a class have become ardent supporters of a nation-wide movement for the conservation of wild life.

SAVING OUR WILD LIFE

Several strong national organizations are doing great service in forwarding the conservation of wild life, as the National Geographic Society, the National Association of Audubon Societies, American Bison Society, Boone and Crockett Club, New York Zoölogical Society, American Game Protective and Propagation Association, Permanent Wild Life Protective Fund, and others. In addition, a large number of unofficial State organizations have been formed to assist in this work.

Through the authorization by Congress, the Federal Government is actively engaged in efforts for the protection and increase of our native birds and mammals. This work is done mainly through the Bureau of Biological Survey of the U. S. Department of Agriculture, which is in charge of the several Federal large-game



From a drawing by Charles R. Knight

A GROTESQUE CREATURE THAT ONCE LIVED IN THE UNITED STATES (UERTATHERIUM EOCENE, MIDDLE WYOMING)

It had six horns on the head and, in some species, two long canine teeth projecting downward from the upper jaw. The feet were somewhat like those of an elephant, but the skull and teeth resemble nothing on earth today.

preserves and nearly seventy bird reservations.

On the large-game preserves are herds of buffalo, elk, deer, and antelope. The Yellowstone National Park, under the Department of the Interior, is one of the most wonderfully stocked game preserves in the world. In this beautiful tract of forest, lakes, rivers, and mountains live many moose, elk, deer, antelope, mountain sheep, black and grizzly bears, wolves, coyotes, mountain lions, and lynxes.

Practically all of the States have game and fish commissions in one form or another, with a warden service for the protection of game, and large numbers of State game preserves have been established. The increasing occupation of the country, the opening up of wild places, and the destruction of forests are rapidly restricting available haunts for game. This renders particularly opportune the present and increasing wide-spread interest in the welfare of the habitants of the wilderness.

The national forests offer an unrivaled opportunity for the protection and increase of game along broad and effective lines. At present the title to game mammals is vested in the States, among which great differences in protective laws and their administration in many cases jeopardize the future game supply.

If a coöperative working arrangement could be effected between the States and the Department of Agriculture, whereby the Department would have supervision and control over the game on the national forests, so far as concerns its protection



From a drawing by Charles R. Knight

THE PRIMITIVE FOUR-TOED HORSE (EOHIPPUS, LOWER EOCENE, WYOMING)

The so-called four-toed horse, a little creature some 12 inches in height at the shoulder, having four well-defined hoofs on the front foot and three on the hind foot. The animal is not a true horse, but was undoubtedly an ancestor (more or less direct) of the modern form. It must have been a very speedy type, which contributed greatly to the preservation of the species in an age when (so far as we know) the carnivores were rather slow and clumsy.

and the designation of hunting areas, varying the quantity of game to be taken from definite areas in accordance with its abundance from season to season, while the States would control open seasons for shooting, the issuance of hunting licenses, and similar local matters, the future welfare of large game in the Western States would be assured.

Under such an arrangement the game supply would be handled on business principles. When game becomes scarce in any restricted area, hunting could be suspended until the supply becomes renewed, while increased hunting could be allowed in areas where there is sufficient game to warrant it. In brief, big game could be handled by the common-sense methods now used so effectively in the stock industry on the open range. At present the lack of a definite general policy to safeguard our game supply and the resulting danger to our splendid native animals are deplorably in evidence.



A TRUE HORSE WHICH WAS FOUND IN THE FOSSIL BEDS OF TEXAS: PLEISTOCENE

It is interesting to note that this country was possessed of several species of wild horses, but these died out long before the advent of the Indian on this continent. The present wild horses of our western plains are merely stragglers from the herds brought over by the Spaniards and other settlers. When Columbus discovered America there were no horses on the continent, though in North America horses and camels originated (see text, page 399).



From drawings by Charles R. Knight

THE FOREST HORSE OF NORTH AMERICA (HYPOHIPPOS MIOCENE)

This animal is supposed to have inhabited heavy undergrowth. It was somewhat off the true horse ancestry and had three rather stout toes on both the fore and hind feet.



Photograph by Gus A. Swanson

A MONTANA DOE AND FAWN

Observers of those times believed that at the beginning of the last century there were more deer and antelope in the United States than there were buffaloes. If that be true, they were probably more numerous than any domestic animal we have today.



THE SPIRIT OF THE WILD

Photograph by Gus A. Swanson

Timorous as a gazelle in the open, brave as a lion when forced to fight, with nerves as quick as lightning and sinews as hard as steel, these denizens of the deep wood match the wind for speed, are unsurpassed for endurance, and yield place to no other species in graceful beauty.

OPOSSUM, VIRGINIA OPOSSUM (Didelphis virginiana and its subspecies)

The opossums are the American representatives of the ancient order of Marsupials—a wonderfully varied group of mammals now limited to America and Australasia. Throughout the order the young are born in an embryonic condition and are transferred to teats located in an external pocket or pouch in the skin of the abdomen, where they complete their development. The kangaroos are among the most striking members of this group.

Numerous species of opossums are known, all peculiar to America and distributed from the eastern United States to Patagonia. The Virginia opossum, the largest of all the species, is characterized by its coarse hair, pig-like snout, naked ears, and long, hairless, prehensile tail. Its toes are long, slender, and so widely spread that its footprints on the muddy border of a stream or in a dusty trail show every toe distinctly, as in a bird track, and are unmistakably different from those of any other mammal.

This is the only species of opossum occurring in the United States, where it occupies all the wooded eastern parts from eastern New York, southern Wisconsin, and eastern Nebraska south to the Gulf coast and into the tropics. It has recently been introduced in central California. Although scarce in the northern parts of its range, it is abundant and well known in the warmer Southern States.

These animals love the vicinity of water, and are most numerous in and about swamps or other wet lowlands and along bottom-lands bordering streams. They have their dens in hollow trees, in holes under the roots of trees, or in similar openings where they may hide away by day. Their food consists of almost everything, animal or vegetable, that is edible, including chickens, which they capture in nocturnal raids.

The Virginia opossums have from 5 to 14 young, which at first are formless, naked little objects, so firmly attached to the teats in the mother's pouch that they can not be shaken loose. Later, when they attain a coating of hair, they are miniature replicas of the adults, but continue to occupy the pouch until the swarming family becomes too large for it. The free toes of opossums are used like hands for grasping, and the young cling firmly to the fur of their mother while being carried about in her wanderings.

They are rather slow-moving, stupid animals, which seek safety by their retiring nocturnal habits and by non-resistance when overtaken by an enemy. This last trait gave origin to the familiar term "playing possum," and is illustrated by their habit of dropping limp and apparently lifeless when attacked. Despite this apparent lack of stamina, their vitality is extraordinary, rendering them difficult to kill.

While hunting at daybreak, I once encountered an unusually large old male opossum on his way home from a night in the forest. When we met, he immediately stopped and stood with hanging head and tail and half-closed eyes. I walked up and, after watching him for several minutes without seeing the slightest movement, put my foot against his side and gave a slight push. He promptly fell flat and lay limp and apparently dead. I then raised him and tried to put him on his feet again, but his legs would no longer support him, and I failed in other tests to obtain the slightest sign of life.

The opossum has always been a favorite game animal in the Southern States, and figures largely in the songs and folk-lore of the southern negroes. In addition, its remarkable peculiarities have excited so much popular interest that it has become one of the most widely known of American animals.

RACCOON (Procyon lotor and its subspecies)

Few American wild animals are more widely known or excite more popular interest than the raccoon. It is a short, heavily built animal with a club-shaped tail, and with hind feet that rest flat on the ground, like those of a bear, and make tracks that have a curious resemblance to those of a very small child. Its front toes are long and well separated, thus permitting the use of the front feet with almost the facility of a monkey's hands.

Raccoons occupy most of the wooded parts of North America from the southern border of Canada to Panama, with the exception of the higher mountain ranges. In the United States they are most plentiful in the Southeastern and Gulf States and on the Pacific coast. Under the varying climatic conditions of their great range a number of geographic races have developed, all of which have a close general resemblance in habits and appearance.

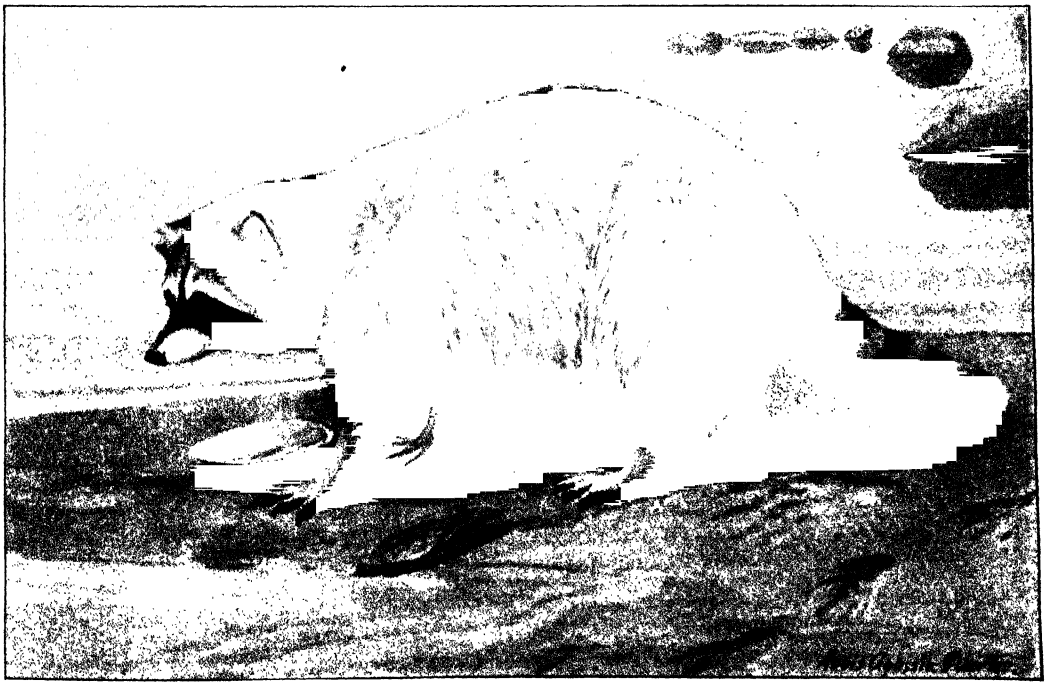
They everywhere seek the wooded shores of streams and lakes and the bordering lowland forests and are expert tree-climbers, commonly having their dens in hollow trees, often in cavities high above the ground. In such retreats they have annually from four to six young, which continue to frequent this retreat until well grown, thus accounting for the numbers often found in the same cavity. Although tree-frequenting animals, the greater part of their activities is confined to the ground, especially along the margins of water-courses. While almost wholly nocturnal in habits, they are occasionally encountered abroad during the day.

Their diet is extraordinarily varied, and includes fresh-water clams, crawfish, frogs, turtles, birds and their eggs, poultry, nuts, fruits, and green corn. When near water they have a curious and unique habit of washing their food before eating it. Their fondness for green corn leads them into frequent danger, for when bottom-land cornfields tempt them away from their usual haunts raccoon hunting with dogs at night becomes an especially favored sport.

Raccoons are extraordinarily intelligent animals and make interesting and amusing pets.



OPOSSUM



During captivity their restless intelligence is shown by the curiosity with which they carefully examine every strange object. They are particularly attracted by anything bright or shining, and a piece of tin fastened to the pan of a trap serves as a successful lure in trapping them.

They patrol the border of streams and lakes so persistently that where they are common they sometimes make well-trodden little trails, and many opened mussel shells or other signs of their feasts may be found on the tops of fallen logs or about stones projecting above the water. In the northern part of their range they hibernate during the coldest parts of the winter, but in the South are active throughout the year.

Raccoons began to figure in our frontier literature at an early date. "Coon-skin" caps, with the ringed tails hanging like plumes, made the favorite headgear of many pioneer hunters, and "coon skins" were a recognized article of barter at country stores. Now that the increasing occupation of the country is crowding out more and more of our wild life, it is a pleasure to note the persistence with which these characteristic and interesting animals continue to hold their own in so much of their original range.

CANADA LYNX (Lynx canadensis)

The lynxes are long-legged, short-bodied cats, with tufted ears and a short "bobbed" tail. They are distributed from the northern limit of trees south into the Temperate Zone throughout most of the northern part of both Old and New Worlds. In North America there are two types—the smaller animal, southern in distribution, and the larger, or Canada lynx, limited to the north, where its range extends from the northern limit of trees south to the northern border of the United States. It once occupied all the mountains of New England and south in the Alleghenies to Pennsylvania. In the West it is still a habitant of the Rocky Mountains as far south as Colorado, and of the Sierra Nevada nearly to Mount Whitney.

The Canada lynx is notable for the beauty of its head, one of the most striking among all our carnivores. This species is not only much larger than its southern neighbor, the bay lynx, but may also be distinguished from it by its long ear tips, thick legs, broad spreading feet, and the complete jet-black end of the tail. It is about 3 feet long and weighs from 15 to over 30 pounds. As befits an animal of the great northern forests, it has a long thick coat of fur, which gives it a remarkably fluffy appearance. Its feet in winter are heavily furred above and below and are so broad that they serve admirably for support in deep snow, through which it would otherwise have to wade laboriously.

This animal does not attack people, though popular belief often credits it with such action. It feeds mainly on such small prey as varying hares, mice, squirrels, foxes, and the grouse and other birds living in its domain; but on occasion it even kills animals as large as mountain sheep. One such feat was actually witnessed above timberline in winter on a spur of Mount McKinley. The lynx sprang from a ledge as the sheep passed below, and, holding on the sheep's neck and shoulders, it reached forward and by repeatedly biting put out its victim's eyes, thus reducing it to helplessness.

The chief food of the Canada lynx is the varying hare, which throughout the North periodically increases to the greatest abundance and holds its numbers for several years. During these periods the fur sales in the London market show that the number of lynx skins received increases proportionately with those of the hare. When an epizoötic disease appears, as it does regularly, and almost exterminates the hares, there is an immediate and corresponding drop in the number of lynx skins sent to market. This evidences one of Nature's great tragedies, not only among the overabundant hares, but among the lynxes, for with the failure of their food supply over a vast area tens of thousands of them perish of starvation.

The Canada lynx has from two to five kittens, which are marked with dusky spots and short bands, indicating an ancestral relationship to animals similar to the ocelot, or tiger-cat, of the American tropics. The young usually keep with the mother for nearly a year. Such families no doubt form the hunting parties whose rabbit drives on the Yukon Islands were described to me by the fur traders and Indians of the Yukon Valley.

During sledge trips along the lower Yukon I often saw the distinctive broad, rounded tracks of lynxes, showing where they had wandered through the forests or crossed the wide, snow-covered river channel. Here and there, as the snow became very deep and soft, the tracks showed where a series of leaps had been made. Lynx trails commonly led from thicket to thicket where hares, grouse, or other game might occur. Canada lynxes appear to be rather stupid animals, for they are readily caught in traps, or even in snares, and, like most cats, make little effort to escape.

BOBCAT, OR BAY LYNX (Lynx ruffus and its subspecies)

The bay lynx, bobcat, or wildcat, as *Lynx ruffus* and its close relatives are variously called in different parts of the country, is one of the most widely distributed and best known of our wild animals. It is about two-thirds the size of the Canada lynx and characterized by much slenderer proportions, especially in its legs and feet. The ears are less conspicuously tufted and the tip of the tail is black only on its upper half. Bobcats range from Nova Scotia and southern British Columbia over practically all of the wooded and brushy parts of the United States except along the northern border, and extend south to the southern end of the high table-land of Mexico.

From the earliest settlement of America the



CANADA LYNX



BOBCAT (Bay Lynx)

bobcat has figured largely in hunting literature, and the popular estimate of its character is well attested by the frontier idea of the superlative physical prowess of a man who can "whip his weight in wildcats." Although our wildcat usually weighs less than 20 pounds, if its reputed fierceness could be sustained it would be an awkward foe. But, so far as man is concerned, unless it is cornered and forced to defend itself, it is extremely timid and inoffensive.

Like all cats, it is very muscular and active, and to the rabbits, squirrels, mice, grouse, and other small game upon which it feeds is a persistent and remorseless enemy. Although an expert tree-climber, it spends most of its time on the ground, where it ordinarily seeks its prey. It is most numerous in districts where birds and small mammals abound, and parts of California seem especially favorable for it. At a mountain ranch in the redwood forest south of San Francisco one winter some boys with dogs killed more than eighty bobcats.

Ordinarily the bobcat seems to be rather uncommon, but its nocturnal habits usually prevent its real numbers being actually known. In districts where not much hunted it is not uncommonly seen abroad by day, especially in winter, when driven by hunger.

The bay lynx makes its den in hollows in trees, in small caves, and in openings among rock piles wherever quiet and safety appear assured. Although a shy animal, it persists in settled regions if sufficient woodland or broken country remains to give it shelter. From such retreats it sallies forth at night, and not only do the chicken roosts of careless householders suffer, but toll is even taken among the lambs of sheep herds.

As in the case of most small cats, the stealthy hunting habits of the bay lynx renders it excessively destructive to ground-frequenting birds, especially to quail, grouse, and other game birds. For this reason, like many of its kind, it is outlawed in all settled parts of the country.

MOUNTAIN LION (**Felis couguar** and its subspecies)

The mountain lion, next to the jaguar, is the largest of the cat tribe native to America. In various parts of its range it is also known as the panther, cougar, and puma. It is a slender-bodied animal with a small head and a long round tail, with a total length varying from seven to nine feet and a weight from about 150 to 200 pounds.

It has from two to five young, which are paler brown than the adult and plainly marked with large dusky spots on the body and with dark bars on the tail. These special markings of the young, as in other animals, are ancestral, and here appear to indicate that in the remote past our plain brown panther was a spotted cat somewhat like the leopard.

No other American mammal has a range equal to that of the mountain lion. It originally inhabited both North and South America from southern Quebec and Vancouver Island to Patagonia and from the Atlantic to the Pacific coasts. Within this enormous territory it appears to be equally at home in an extraordinary variety of conditions. Formerly it was rather common in the Adirondacks of northern New York and still lives in the high Rocky Mountains of the West, where it endures the rigors of the severest winter temperatures. It is generally distributed, where large game occurs, in the treeless ranges of the most arid parts of the southwestern deserts, and is also well known in the most humid tropical forests of Central and South America, whose gloomy depths are drenched by almost continual rain.

A number of geographic races of the species have been developed by the varied character of its haunts. These are usually characterized by differences in size and by paler and grayer shades in the arid regions and by darker and browner ones in the humid areas.

The mountain lion, while powerful enough to be dangerous to man, is in reality extremely timid. Owing to its being a potentially dangerous animal, the popular conception of it is that of a fearsome beast, whose savage exploits are celebrated in the folk-lore of our frontier. As a matter of fact, few wild animals are less dangerous, although there are authentic accounts of wanton attacks upon people, just as there are authentic instances of buck deer and moose becoming aggressive. It has a wild, screaming cry which is thrillingly impressive when the shades of evening are throwing a mysterious gloom over the forests. In the mountains of Arizona one summer a mountain lion repeatedly passed along a series of ledges high above my cabin at dusk, uttering this loud weird cry, popularly supposed to resemble the scream of a terrified woman.

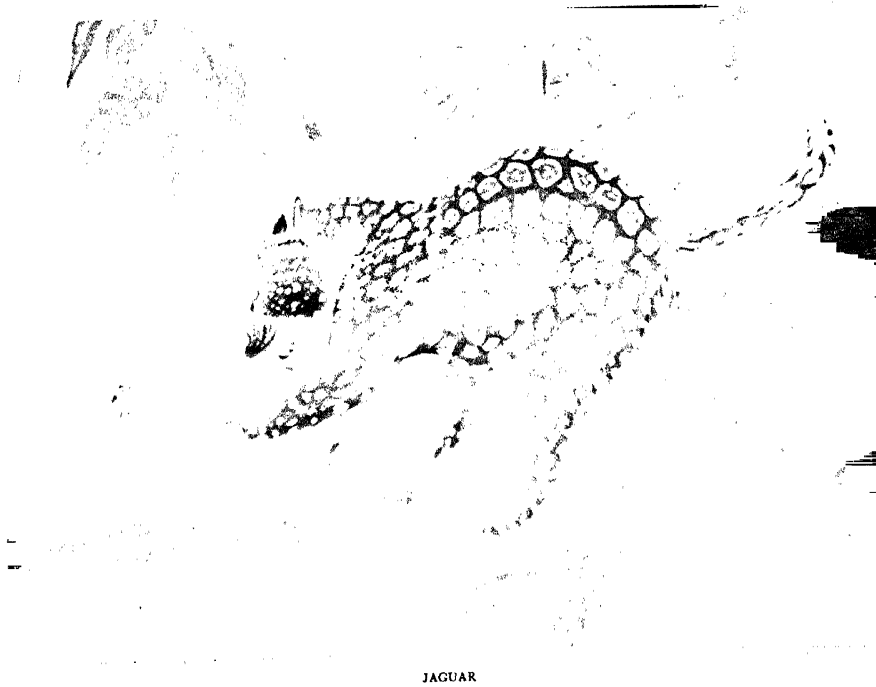
The mountain lion is usually nocturnal, but in regions where it is not hunted it not infrequently goes abroad by day. It is a tireless wanderer, often traveling many miles in a single night, sometimes in search of game and again in search of new hunting grounds. I have repeatedly followed its tracks for long distances along trails, and in northern Chihuahua I once tracked one for a couple of miles from a bare rocky hill straight across the open, grassy plain toward a treeless desert mountain, for which it was heading, some eight or ten miles away.

Although inoffensive as to people, this cat is such a fierce and relentless enemy of large game and live stock that it is everywhere an outlaw. Large bounties on its head have resulted in its extermination in most parts of the eastern United States and have diminished its numbers elsewhere. It is not only hunted with gun and dog but also with trap and poison.

A mountain lion usually secures its prey by a silent, cautious stalk, taking advantage of every cover until within striking distance, and then, with one or more powerful leaps, dashing the victim to the ground with all the stunning impact of its weight. In a beautiful live-oak forest on the mountains of San Luis Potosi I



MOUNTAIN LION



JAGUAR

once trailed one of these great cats to the spot where it had killed a deer a short time before, and could plainly read in the trail the story of the admirable skill with which it had moved from cover to cover until it reached a knoll at one side of the little glade where the deer was feeding. Then a great leap carried it to the deer's back and struck the victim to the ground with such violence that it slid 10 or 12 feet across the sloping ground, apparently having been killed on the instant.

Another trail followed in the snow on the high mountains of New Mexico led to the top of a projecting ledge from which the lion had leaped out and down over 20 feet, landing on the back of a deer and sliding with it 50 feet or more down the snowy slope.

The mountain lion often kills calves, but is especially fond of young horses. In many range districts of the Western States and on the table-land of Mexico, owing to the depredations of this animal, it is impossible to raise horses. Unfortunately the predatory habits of this splendid cat are such that it can not continue to occupy the same territory as civilized man and so is destined to disappear before him.

JAGUAR (Felis hernandesi and its subspecies)

The jaguar, or "el tigre," as it is generally known throughout Spanish America, is the largest and handsomest of American cats. Its size and deep yellow color, profusely marked with black spots and rosettes, give it a close resemblance to the African leopard. It is, however, a heavier and more powerful animal. In parts of the dense tropical forests of South America coal-black jaguars occur, and while representing merely a color phase, they are popularly supposed to be much fiercer than the ordinary animal.

Jaguars are characteristic animals of the tropics in both Americas, frequenting alike the low jungle of arid parts as well as the great forests of the humid regions. In addition, they range south into Argentina and north into the southwestern United States. Although less numerous within our borders than formerly, they still occur as rare visitants as far north as middle Texas, middle New Mexico, and northern Arizona. They are so strictly nocturnal that their presence in our territory is usually not suspected until, after depredations on stock usually attributed to mountain lions, a trap or poison is put out and reveals a jaguar as the offender. Several have been killed in this way within our border during the last ten years, including one not far from the tourist hotel at the Grand Canyon of Arizona.

Although so large and powerful, the jaguar has none of the truculent ferocity of the African leopard. During the years I spent in its country, mainly in the open, I made careful inquiry without hearing of a single case where one had attacked human beings. So far as I could learn, it has practically the same shy and cowardly nature as the mountain lion. Despite this, the natives throughout its tropical home have a great fear of "el tigre," as I saw evidenced repeatedly in Mexico. Apparently this fear is based wholly on its strength and potential ability to harm man if it so desired.

Jaguars are very destructive to the larger game birds and mammals of their domain and to horses and cattle on ranches. On many large tropical ranches a "tigrero," or tiger hunter, with a small pack of mongrel dogs, is maintained, whose duty it is immediately to take up the trail when a "tigre" makes its presence known, usually by killing cattle. The hunter steadily continues the pursuit, sometimes for many days, until the animal is either killed or driven out of the district. It is ordinarily hunted with dogs, which noisily follow the trail, but its speed through the jungle often enables it to escape. When hard pressed it takes to a tree and is easily killed.

Few predatory animals are such wanderers as the jaguar, which roams hundreds of miles from its original home, as shown by its occasional appearance far within our borders. In the heavy tropical forest it so commonly follows the large wandering herds of white-lipped peccaries that some of the Mexicans contend that every large herd is trailed by a tiger to pick up stragglers. Along the Mexican coast in spring, when sea turtles crawl up the beaches to bury their eggs in the sand, the rising sun often reveals the fresh tracks of the jaguar where it has traveled for miles along the shore in search of these savory deposits.

In one locality on the Pacific coast of Guerrero I found that the hardier natives had an interesting method of hunting the "tigre" during the mating period. At such times the male has the habit of leaving its lair near the head of a small canyon in the foothills early in the evening and following down the canyon for some distance, at intervals uttering a subdued roar. On moonlight nights at this time the hunter places an expert native with a short wooden trumpet near the mouth of the canyon to imitate the "tigre's" call as soon as it is heard and to repeat the cry at proper intervals. After placing the caller, the hunter ascends the canyon several hundred yards and, gun in hand, awaits the approach of the animal. The natives have many amusing tales of the sudden exit of untried hunters when the approaching animal unexpectedly uttered its roar at close quarters.

JAGUARUNDI CAT, OR EYRA (Felis cacomitli and its subspecies)

The eyra differs greatly in general appearance from any of our other cats, although it is one of the most characteristic of the American members of this widely spread family. It is larger than an otter, with a small flattened head, long body, long tail, and short legs, thus having a distinctly otterlike form. It is characterized by two color phases—one a dull gray or dusky, and the other some shade of rusty rufous. Animals of these different colors were long supposed to represent distinct species, but



RED AND GRAY PHASES OF THE JAGUARUNDI CAT, OR EYRA



TIGER-CAT, OR OCELOT

it has been learned not only that color is the only difference between the two, but also that the two colors are everywhere found together, affording satisfactory evidence that they are merely color phases of the same species.

The eyra is a habitant of brush-grown or forested country, mainly in the lowlands, from the lower Rio Grande Valley of Texas south to Paraguay. In this vast territory it has developed a number of geographic races.

In southern Texas, where it is often associated with the ocelot, the eyra lives in dense thorny thickets of mesquites, acacias, ironwood, and other semitropical chaparral in a region of brilliant sunlight; but farther south it also roams the magnificent forests of the humid tropics, in which the sun rarely penetrates. It appears to be even more nocturnal and retiring than most of our cats, and but little is known of its life history. The results of thorough trapping in the dense thorny thickets near Brownsville, Texas, indicate that it is probably more common than is generally supposed.

The natives in the lowlands of Guerrero, on the Pacific coast of Mexico, informed me that the eyra in that region is fond of the vicinity of streams, and that it takes to the water and swims freely, crossing rivers whenever it desires. Its otterlike form goes well with such habits, and further information may prove that it is commonly a water-frequenting animal. Its unusual form and dual coloration and our lack of knowledge regarding the life of the eyra unite to make it one of the most interesting of our carnivores.

TIGER-CATS, OR OCELOTS (Felis pardalis and its relatives)

The brushy and forested areas of America from southern Texas and Sonora to Paraguay are inhabited by spotted cats of different species, varying from the size of a large house cat to that of a Canada lynx. Only one of these occurs in the United States. All are characterized by long tails and a yellowish ground color, conspicuously marked by black spots, and on neck and back by short, longitudinal stripes—a color pattern that strongly suggests the leopard.

In the lower Rio Grande Valley of Texas the tiger-cat is rather common, with the eyra-cat, in areas densely overgrown with thorny chaparral. Like most of the cat tribe, it is strictly nocturnal and by day lies well hidden in its brushy shelter. By night it wanders along trails over a considerable territory, seeking its prey. Birds of all kinds, including domestic poultry, are captured on their roosts, and rabbits, wood rats, and mice of many kinds, as well as snakes and other reptiles, are on its list of game.

Its reptile-eating habit was revealed to me unexpectedly one day in the dense tropical forest of Chiapas. I was riding along a steep trail beside a shallow brush-grown ravine when a tiger-cat suddenly rushed up the trunk of a tree close by. A lucky shot from my revolver brought it to the ground, and I found it lying in the ravine by the body of a recently killed boa about 6 or 7 feet long. It had eaten the boa's head and neck when my approach interrupted the feast.

The first of these cats I trapped in Mexico was captured the night after my arrival, in a trail bordering the port of Manzanillo, on the Pacific coast. The rejoicing of the natives living close by evidenced the toll this marauder had been taking from their chickens.

The tiger-cat is much more quiet and less fierce in disposition than most felines. It excited my surprise and interest whenever I trapped one to note how nonchalantly it took the situation. The captive never dashed wildly about to escape, but when I drew near sat and looked quietly at me without the slightest sign of alarm and with little apparent interest. A small trap-hold, even on the end of a single toe, was enough to retain the victim. On one occasion, while a cat thus held sat looking at me, it quietly reached to one side and sank its teeth into the bark of a small tree to which the trap was attached, and then resumed its air of unconcern.

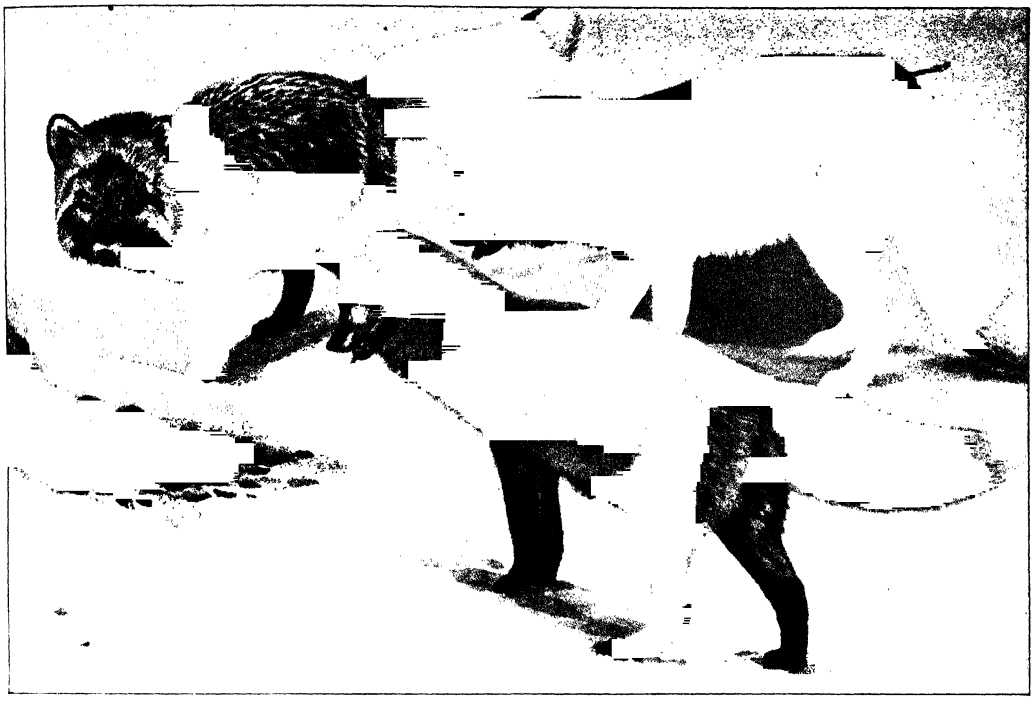
The tiger-cat brings within our fauna an interesting touch of the tropics and its exuberance of animal life. It is found in so small a corner of our territory, however, that, despite its mainly inoffensive habits, it is certain to be crowded out in the near future by the increased occupation of its haunts.

RED FOX (Vulpes fulva and its relatives)

Red foxes are characterized by their rusty red fur, black-fronted fore legs, and white-tipped tail. They inhabit the forested regions in the temperate and subarctic parts of both Old and New Worlds, and, like other types of animal life having a wide range, they break up into numerous distinct species and geographic races.

In America they originally ranged over nearly all the forested region from the northern limit of trees in Alaska and Canada south, east of the Great Plains, to Texas; also down the Rocky Mountains to middle New Mexico, and down the Sierra Nevada to the Mount Whitney region of California. They are unknown on the treeless plains of the West, including the Great Basin. Originally they were apparently absent from the Atlantic and Gulf States from Maryland to Louisiana, but have since been introduced and become common south to middle Georgia and Alabama.

Wherever red foxes occur they show great mental alertness and capacity to meet the requirements of their surroundings. In New England they steadily persist, though their raids on poultry yards have for centuries set the hand of mankind against them. For a time conditions favored them in parts of the Middle Atlantic States, for the sport of hunting to hounds was imported from England, and the foxes had partial protection. This exotic



CROSS FOX RED FOX SILVER FOX

The precious black and silver gray foxes are merely color phases occurring in litters of the ordinary red animal (see a xt, page 416)



ALASKA RED FOX

amusement has now passed and the fox must everywhere depend on his nimble wits for safety.

Since the days of Æsop's fables tales of foxes and their doings have had their place in literature as well as in the folk-lore of the countryside. Many of their amazing wiles to outwit pursuers or to capture their prey give evidence of extraordinary mental powers.

Their bill of fare includes many items, as mice, birds, reptiles, insects, many kinds of fruits, and on rare occasions a chicken. The bad name borne by them among farmers, due to occasional raids on the poultry yard, is largely unwarranted. They kill enormous numbers of mice and other small rodents each year, and thus well repay the loss of a chicken now and then.

Red foxes apparently pair for life and occupy dens dug by themselves in a secluded knoll or among rocks. These dens, which are sometimes occupied for years in succession, always have two or more entrances opening in opposite directions, so that an enemy entering on one side may be readily eluded. The young, numbering up to eight or nine, are tenderly cared for by both parents.

Although they have been persistently hunted and trapped in North America since the earliest times, they still yield a royal annual tribute of furs. It is well known that the highly prized cross, as well as the precious black, and silver gray foxes are merely color phases occurring in litters of the ordinary red animal. Black skins are so highly prized that specially fine ones have sold for more than $2,500 each in the London market. The reward thus offered has resulted in the development of black fox fur-farms, which have been very successful in parts of Canada and the United States, thus originating a valuable new industry.

By the modern regulation of trapping, foxes and other fur-bearers are destined to survive wherever conditions are favorable. In addition to the economic value of foxes, the location of an occasional fox den here and there on the borders of a woodland tract, the meandering tracks in the snow, and the occasional glimpse of animals cautiously making their rounds add a keen touch of primitive nature well worth preserving in any locality.

ALASKA RED FOX (Vulpes kenaiensis)

The red fox of the Kenai Peninsula, Alaska, and the adjacent mainland is probably the largest of its kind in the world, although those of Kodiak Island and of the Mackenzie River valley are nearly as large. Compared with its relatives of the United States, the Kenai fox is a giant, with heavier, duller-colored coat and a huge tail, more like that of a wolf than of a fox. The spruce and birch forests of Alaska and the Mackenzie Valley are apparently peculiarly adapted to red foxes, as shown by the development there of these animals—good illustrations of the relative increase in size and vigor of animals in a specially favorable environment.

As noted in the general account of the red foxes, the occurrence of the black phase is sporadic, and the relative number of dark individuals varies greatly in different parts of their range. The region about the upper Yukon and its tributaries and the Mackenzie River basin are noted for the number of black foxes produced, apparently a decidedly greater proportion than in any other similarly large area. The prices for which these black skins sell in the London market prove them to be of equal quality with those from any other area.

Like other red foxes, the Alaskan species digs its burrows, with several entrances, in some dry secluded spot, where both male and female share in the care of the young. In northern wilds the food problem differs from that in a settled country. There the surrounding wild life is the only dependence, and varying hares, lemmings, and other mice are usually to be had by the possessor of a keen scent and an active body. In summer many nesting wild-fowl and their young are easy prey, while heathberries and other northern fruits are also available.

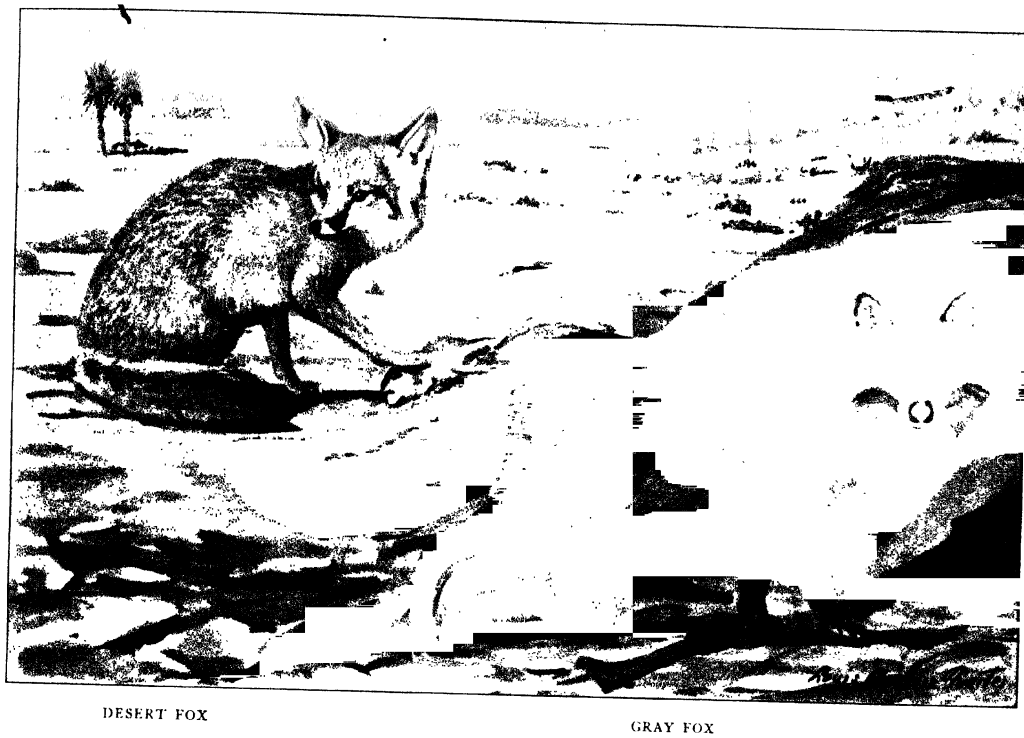
Winter brings a season of scarcity, when life requires the exercise of every trained faculty. The snow-white ptarmigan is then a prize to be gained only by the most skillful stalking, and the white hare is almost equally difficult to secure. At this season foxes wander many miles each day, their erratic tracks in the snow telling the tale of their industrious search for prey in every likely spot. It is in this season of insistent hunger that many of them fall victims to the wiles of trappers or to the unscrupulous hunter who scatters poisoned baits.

Fortunately the season for trapping these and other fur-bearers in Alaska is now limited by law and the use of poisons is forbidden. These measures will aid in preserving one of the valuable natural assets of these northern wilds.

GRAY FOX (Urocyon cinereoargenteus and its relatives)

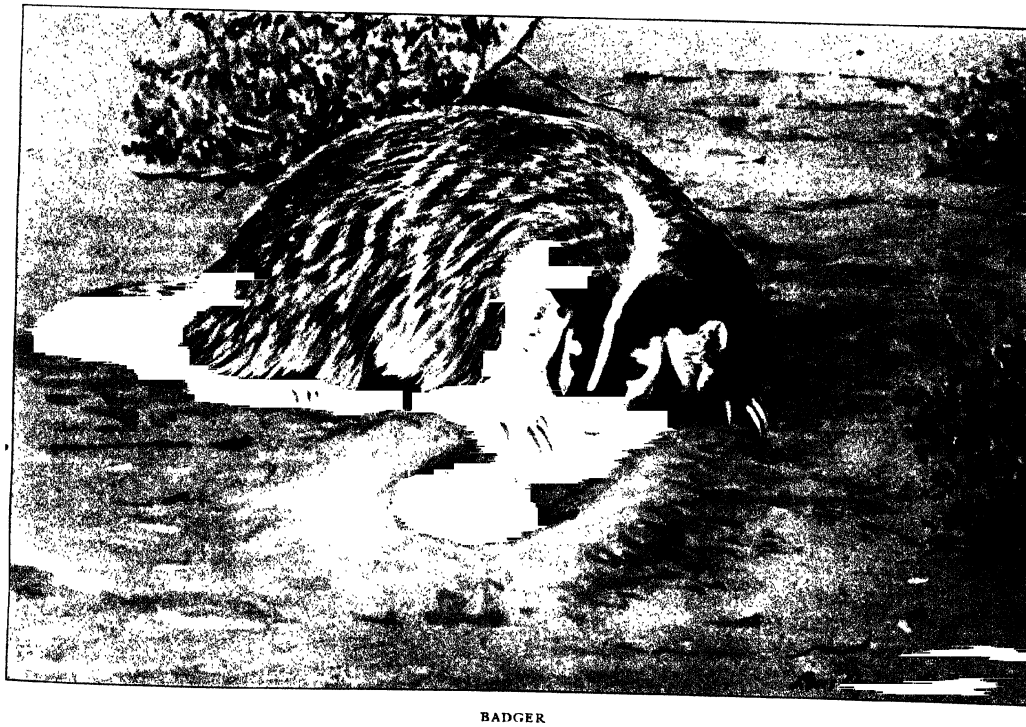
Gray foxes average about the size of common red foxes, but are longer and more slender in body, with longer legs and a longer, thinner tail. They are peculiar to America, where they have a wide range—from New Hampshire, Wisconsin, and Oregon south through Mexico and Central America to Colombia. Within this area there are numerous geographic forms closely alike in color and general appearance, but varying much in size; the largest of all, larger than the red fox, occupying the New England States.

Gray foxes inhabit wooded and brush-grown country and are much more numerous in the arid or semiarid regions of the southwestern United States and western Mexico than elsewhere. In parts of California they are far more numerous than red foxes ever become. They do not regularly dig a den, but occupy a hollow tree or cavity in the rocks, where they bring forth from three to five young each spring. As with other foxes, the cubs are born blind and helpless, and are also almost blackish in color, entirely unlike the adults. The par-



DESERT FOX

GRAY FOX



BADGER

ents, as usual with all members of the dog family, are devoted to their young and care for them with the utmost solicitude.

Like other members of the tribe, they are omnivorous and feed upon mice, squirrels, rabbits, birds, and large insects, in addition to acorns or other nuts and fruits of all kinds. In Lower California they are very common about the date-palm orchards, which they visit nightly for fallen fruit. They also make nocturnal visits to poultry yards.

In some parts of the West they are called "tree foxes," because when pursued by dogs they often climb into the tops of small branching trees.

On one occasion in Arizona I saw a gray fox standing in the top of a large, leaning mesquite tree, about thirty feet from the ground, quietly gazing in various directions, as though he had chosen this as a lookout point. As soon as he saw me he came down at a run and swiftly disappeared.

In the same region I found a den in the hollow base of an old live-oak containing three young only a few days old. The mother was shot as she sprang from the hole on my approach and the young taken to camp. There the skin of the old fox, well wrapped in paper, was placed on the ground at one side of the tent, and an open hunting bag containing the young placed on the opposite side, about ten feet away. On returning an hour later, I was amazed to find that all three of the young, so small they could crawl only with the utmost difficulty, and totally blind, had crossed the tent and managed to work their way through the paper to the skin of their mother, thus showing that the acute sense of smell in these foxes becomes of service to them at a surprisingly early age.

DESERT FOX (Vulpes macrotis and its subspecies)

A small fox, akin to the kit fox or swift of the western plains, frequents the arid cactus-grown desert region of the Southwest. It is found from the southern parts of New Mexico, Arizona, and California south into the adjacent parts of Mexico. The desert fox is a beautiful species, slender in form, and extraordinarily quick and graceful in its movements, but so generally nocturnal in habits as to be rarely seen by the desert traveler. On the rare occasions when one is encountered abroad by day, if it thinks itself unobserved by the traveler it usually flattens itself on the ground beside any small object which breaks the surface, and thus obscured will permit a horseman to ride within a few rods without moving. If the traveler indicates by any action that he has seen it, the fox darts away at extraordinary speed, running with a smooth, floating motion which seems as effortless as that of a drifting thistledown before a breeze.

The desert fox digs a burrow, with several entrances, in a small mound, or at times on an open flat, and there rears four or five young each year. Its main food consists of kangaroo rats, pocket mice, small ground-squirrels, and a variety of other small desert mammals. In early morning fox tracks, about the size of those of a house-cat, may be seen along sandy arroyos and similar places where these small carnivores have wandered in search of prey.

Like the kit, the desert fox has little of the sophisticated mental ability of the red fox and falls an easy prey to the trapper. It is nowhere numerous and occupies such a thinly inhabited region that there is little danger of its numbers greatly decreasing in the near future.

BADGER (Taxidea taxus and its subspecies)

The favorite home of the badger is on grassy, brush-grown plains, where there is an abundance of mice, pocket gophers, ground-squirrels, prairie-dogs, or other small mammals. There it wanders far and wide at night searching for the burrows of the small rodents, which are its chief prey. When its acute sense of smell announces that a burrow is occupied, it sets to work with sharp claws and powerful fore legs and digs down to the terrified inmate in an amazingly short time.

The trail of a badger for a single night is often marked by hole after hole, each with a mound of fresh earth containing the tracks of the marauder. As a consequence, if several of these animals are in the neighborhood, their burrows, 6 or 8 inches in diameter, soon become so numerous that it is dangerous to ride rapidly through their haunts on horseback.

Although a member of the weasel family, the badger is so slow-footed that when it is occasionally found abroad by day a man on foot can easily overtake it. When brought to bay, it charges man or dog and fights with such vicious power and desperation that nothing of its own size can overcome it. It appears to have a morose and savage nature, lacking the spice of vivacity or playfulness which appears in many of its relatives.

Although commonly found living by itself in a den, it is often found moving about by day in pairs, indicating the probability that it may mate permanently. In the northern part of its range it hibernates during winter, but in the south remains active throughout the year. Its shy and retiring character is evidenced by the little information we have concerning its family life. The badger is so destructive to rodents that its services are of great value to the farmer. Regardless of this, where encountered it is almost invariably killed. As a consequence, the increasing occupation of its territory must result in its steady decrease in numbers and final extermination.

The American badger is a close relative of the well-known badger occupying the British Isles and other northern parts of the Old World. It is a low, broad, short-legged, powerfully built animal of such wide distribution that it has developed several geographic races. Its range originally extended from about 58 degrees of latitude, on the Peace River, in



THE PEARY CARIBOU
One of the geographic forms of the Barren Ground Caribou
(see text, page 460)

ARCTIC WOLF

Canada, south to the plains of Puebla, on the southern end of the Mexican table-land, and from Michigan, Kansas, and Texas west to the Pacific coast. It has now become extinct over much of this area and is everywhere greatly reduced in numbers.

It appears to thrive equally well on the plains of Alberta, in the open pine forests of the Sierra Nevada in California, and on the dry tropical lowlands at the southern end of the Peninsula of Lower California.

ARCTIC WOLF (Canis tundrarum)

In order to fit properly into a high northern environment, Arctic wolves have developed white coats, which they wear throughout the year. They are among the largest of their kind and have all the surpassing vigor needful for successful beasts of prey in the rigors of such a home. Nature is more than ordinarily hard on weaklings in the far North and only the fittest survive.

The range of the white wolves covers the treeless barren grounds bordering the Arctic coast of Alaska and Canada and extending thence across the Arctic islands to the north coast of Greenland beyond 83 degrees of latitude.

The short summer in the far North is the season of plenty, during which swarms of wild fowl furnish a bountiful addition to the regular food supply. Young wolves are reared and the pack feeds fat, laying up a needed reserve strength for the coming season of darkness. When winter arrives lemmings and Arctic hares and an occasional white fox furnish an uncertain food supply for such insistent hunger as that of wolves, and larger game is a necessity.

In the northern part of their range they share with the other denizens of that land the months of continuous night. There, amid relentless storms and iron frosts, the trail, once found, must be held to the end. The chase is made in the gloom of continuous night and the white caribou or musk-ox herd is brought to bay, and by the law of the pack food is provided.

White wolves are the one dreaded foe Nature has given the musk-ox and the caribou in the northern wilds. The number of the wolves, as with other carnivores, varies with the abundance of their chief prey, and they will disappear automatically with the caribou and musk-oxen.

GRAY, OR TIMBER, WOLF (Canis nubilus and its relatives)

Large wolves, closely related to those of Europe and Siberia, once infested practically all of Arctic and temperate North America, excepting only the arid desert plains. This range extended from the remotest northern lands beyond 83 degrees of latitude south to the mountains about the Valley of Mexico.

When America was first colonized by white men, wolves were numerous everywhere in proportion to the great abundance of game animals. With the increased occupation of the continent and the destruction of most of its large game, wolves have entirely disappeared from large parts of their former domain. They still occur in varying numbers in the forest along our northern border from Michigan westward, and south along the Rocky Mountains and the Sierra Madre to Durango, Mexico, and also in all the Gulf States.

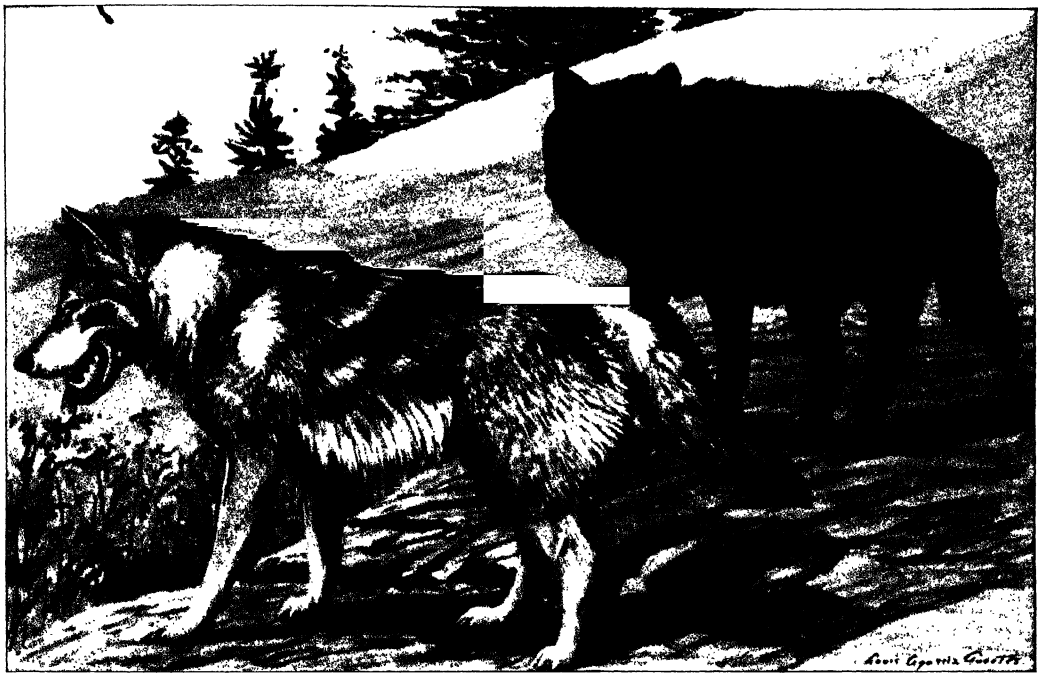
The variations in climate and other physical conditions within their range has resulted in the development of numerous geographic races, and perhaps of species, of wolves, which show marked differences in size and color. The white Arctic wolf, described on pages 422 and 424, is one of the most notable of these, but the gray wolf of the Rocky Mountain region and the eastern United States is the best known.

Since the dawn of history Old World wolves, when hunger pressed, have not hesitated to attack men, and in wild districts have become a fearful scourge. American wolves have rarely shown this fearlessness toward man, probably owing to the abundance of game before the advent of white men and to the general use of firearms among the pioneers. That wolves are extremely difficult to exterminate is shown by their persistence to the present day in parts of France and elsewhere in Europe. This is due both to their fecundity (they have from eight to twelve young), and to their keen intelligence, which they so often pit successfully against the wiles of their chief enemy—man.

Gray wolves appear to mate permanently, and in spring their young are born in natural dens among great rocks, or in a burrow dug for the purpose in a hillside. There both parents exercise the greatest vigilance for the protection of the young. The male kills and brings in game and stands guard in the neighborhood, while the mother devotes most of her time to the pups while they are very small. At other times of year packs made up of one or more pairs and their young hunt together with a mutual helpfulness in pursuing and bringing down their prey that shows a high order of intelligence. Wolves are in fact first cousins of the dog, whose mental ability is recognized by all.

During the existence of the great buffalo herds, packs of big gray "buffalo wolves" roamed the western plains, taking toll wherever it pleased them. Since these vast game herds have disappeared only a small fraction of the wolves have survived. There are enough, however, not only to commit great ravages among the deer and other game in northern Michigan and on the coastal islands of Alaska, but also to destroy much live stock in the Rocky Mountain region.

So serious have the losses in cattle and sheep on the ranges become that Congress has recently made large appropriations for the destruction of wolves and other predatory animals, and these disturbers of the peace will soon become much reduced in numbers. The



GRAY, OR TIMBER, WOLF

BLACK WOLF



PLAINS COYOTE, OR PRAIRIE WOLF



ARIZONA, OR MEARNS, COYOTE

necessity for action of this kind is shown by the recent capture in Colorado of a huge old dog wolf with a definite record of having killed about $3,000 worth of stock. Interesting as wolves are, filling their place in the wilderness, their habits bar them from being tolerated in civilized regions.

PLAINS COYOTE, OR PRAIRIE WOLF
(Canis latrans)

Western North America is inhabited by a peculiar group of small wolves, known as coyotes, this being a Spanish corruption of the Aztec name *coyotl*. They range from northern Michigan, northern Alberta, and British Columbia south to Costa Rica, and from western Iowa and Texas to the Pacific coast. As a group they are animals of the open plains and sparsely wooded districts, ranging from sea-level to above timber-line on the highest mountains. They are most at home on the wide brushy or grassy plains of the western United States and the table-lands of Mexico.

Within their great area coyotes have developed several distinct species and a number of geographic races, distinguished by differences in size, color, and other characteristics. Some attain a size almost equaling that of the gray wolf, while others are much smaller.

They are less courageous and have less of the social instinct than gray wolves, and on the rare occasions when they hunt in packs they form, no doubt, a family party, including the young of the year. They appear to pair more or less permanently and commonly hunt in couples. The young, sometimes numbering as many as fourteen, are born in a burrow dug in a bank, or in a den among broken rocks and ledges. Young animals are readily tamed, and it is entirely probable that some of the dogs found by early explorers among western Indians may have descended from coyotes.

Coyotes are a familiar sight to travelers in the wildest parts of the West. Here and there one is seen trotting through the sagebrush or other scrubby growth, or stopping to gaze curiously at the intruder. If suddenly alarmed, they race away across the plains with amazing speed. At night their high-pitched, wailing howls voice the lonely spirit of waste places.

With the growth of settlement in the West and the steady decrease of large and small game, coyotes have become more and more destructive to poultry and all kinds of live stock. As a result, every man's hand is against them, reinforced by gun, trap, and poison. Despite years of this persistent warfare, their acute intelligence, aided by their extraordinary fecundity, has enabled them to hold their own over a great part of their original range. Their depredations upon live stock have been so great that many millions of dollars have been paid in bounties for their destruction.

This method of control has proved so ineffective, however, that the Federal Government has engaged in the task of suppressing them, together with the other less numerous predatory animals of the West, and has placed about 300 hunters in the field for this purpose. The complete destruction of coyotes would, no doubt, upset the balance of nature in favor of rabbits, prairie-dogs, and other harmful rodents, and thus result in a very serious increase in the destruction of crops.

The coyote supplies much interest and local color to many dreary landscapes and has become a prominent figure in the literature of the West. There it is usually symbolic of shifty cunning and fleetness of foot. Whatever his faults, the coyote is an amusing and interesting beast, and it is hoped that the day of his complete disappearance from our wild life may be far in the future.

ARIZONA, OR MEARNS, COYOTE
(Canis mearnsi)

The Arizona coyote is one of the smallest and at the same time the most handsomely colored of all its kind. Its home is limited to the arid deserts on both sides of the lower Colorado River, but mainly in southwestern Arizona and adjacent parts of Sonora. This is one of the hottest and most arid regions of the continent, and for coyotes successfully to hold their own there requires the exercise of all the acute intelligence for which they are noted. Instead of the winter blizzards and biting cold encountered in the home of the plains coyote, this southern species has to endure the furnacelike heat of summer, with occasional long periods of drought, when water-holes become dry, plant life becomes dormant, and a large part of the smaller mammal life perishes.

The Arizona coyote, like others of its kind, is omnivorous. In seasons of plenty, rabbits, kangaroo rats, pocket gophers, and many other desert rodents cost only the pleasant excitement of a short stalk. With the changing seasons the flesh diet is varied by the sugary mesquite beans, juicy cactus fruit, and other products of thorny desert plants. Wherever sufficient water is available for irrigation, small communities of Indians or Mexicans are to be found. About such centers many coyotes usually establish themselves and fatten on poultry, green corn, melons, and other fruits provided by the labor of man. Many of them also patrol the shores of the Gulf of California and feast upon the eggs of turtles and other spoils of the sea.

The arrival of men at a desert water-hole is quickly known among these alert foragers, and when the travelers arise at daybreak they are likely to see tell-tale tracks on the sand where one or two coyotes have walked in and out between their sleeping places and all about camp. Shortly afterward the campers, if inexperienced, may learn that bacon and other food are contraband and always confiscated by these dogs of the desert. These camp marauders often stand among the bushes only 75 or 100 yards away in the morning and watch the intruders with much curiosity until some hostile movement starts them off in rapid flight.

WHITE, OR ARCTIC, FOX (Alopex lagopus)

The Arctic fox, clothed in long, fluffy white fur, is an extremely handsome animal, about two-thirds the size of the common red fox. It is a circumpolar species, which in America ranges over all the barren grounds beyond the limit of trees, including the coastal belt of tundra from the Peninsula of Alaska to Bering Straits, the Arctic islands, and the frozen sea to beyond 83 degrees of latitude.

The blue fox of commerce is a color phase of this species, usually of sporadic occurrence, like the black phase of the red fox. The white fox makes its burrow either in a dry mound, under a large rock, or in the snow, where its young are brought forth and cared for with the devotion which appears to characterize all foxes.

How this small and delicately formed animal manages to sustain life under the rigorous winter conditions of the far north has always been a mystery to me. I have seen its tracks on the sea ice miles from shore. It regularly wanders far and wide over these desolate icy wastes, which can offer only the most remote chance for food. However, it appears to thrive, with other animal life, even where months of continuous night follow the long summer day.

The food of the Arctic fox includes nearly all species of the wild-fowl which each summer swarm into the far North to breed. There on the tundras congregate myriads of ducks, geese, and waders, while on the cliffs and rocky islands are countless gulls and other water birds. In winter they find lemmings and other northern mice, occasional Arctic hares, and ptarmigan, as well as fragments of prey left by Arctic wolves or polar bears. Now and then the carcass of a whale is stranded or frozen in the ice, furnishing an abundance of food, sometimes for a year or more, to the foxes which gather about it from a great distance.

Perhaps owing to its limited experience with man, the northern animal is much less suspicious than the southern red fox. During winter sledge trips in Alaska I frequently had two or three of them gather about my open camp on the coast, apparently fascinated by the little camp-fire of driftwood. They would sit about, near by in the snow, for an hour or two in the evening, every now and then uttering weak, husky barks like small dogs.

The summer of 1881, when we landed from the *Corwin* on Herald Island, northwest of Bering Straits, we found many white foxes living in burrows under large scattered rocks on the plateau summit. They had never seen men before and our presence excited their most intense interest and curiosity. One and sometimes two of them followed closely at my heels wherever I went, and when I stopped to make notes or look about, sat down and watched me with absurd gravity. Now and then one at a distance would mount a rock to get a better view of the stranger.

On returning to the ship, I remembered that my notebook had been left on a large rock over a fox den, on the island, and at once went back for it. I had been gone only a short time, but no trace of the book could be found on or about the rock, and it was evident that the owner of the den had confiscated it. Several other foxes sat about viewing my search with interest and when I left followed me to the edge of the island. A nearly grown young one kept on the *Corwin* was extraordinarily intelligent, inquisitive, and mischievous, and afforded all of us much amusement and occasional exasperation.

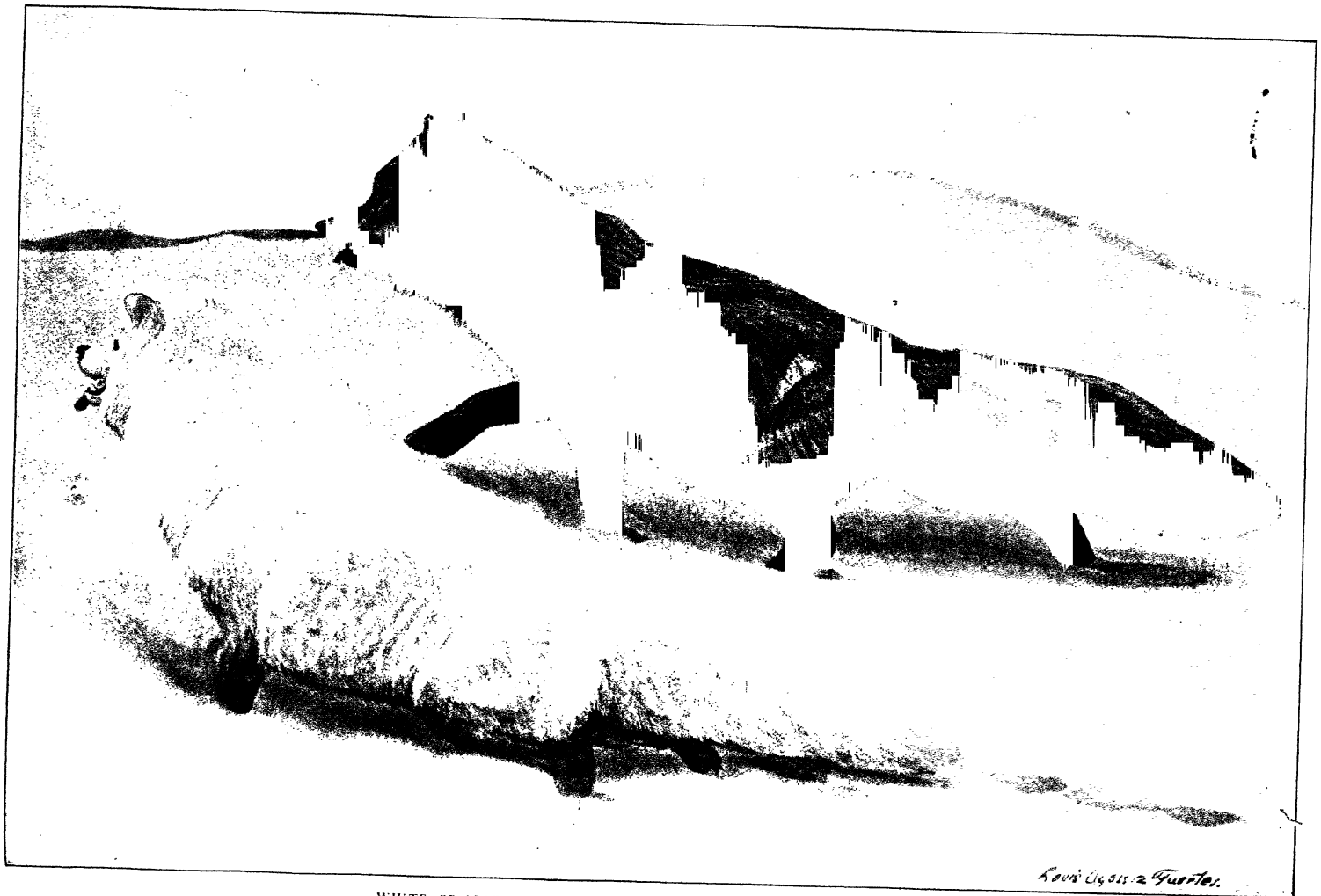
PRIBILOF BLUE FOX (Alopex lagopus pribilofensis)

The blue fox is a color phase of the Arctic white fox and may occur anywhere in the range of the typical animal. In fact, the blue phase bears the same relationship to the white that the black phase does to the red fox. In the Pribilof, or Fur Seal, Islands of Alaska, however, through the influence of favorable climatic conditions, assisted by artificial selection in weeding out white animals, the blue phase has become the resident form. Isolation on these islands has developed other characters also which, with the prevailing color, render the Pribilof animal a distinct geographic race of the white species. A blue fox is also the prevailing resident animal in Iceland.

In years when fur-seals were killed in considerable numbers on the Pribilofs their carcasses remained on the killing grounds as a never-failing store of food through the winter. During summer there is an abundance of nesting water-fowl, and throughout the year there are mice on land and the products of the sea along shore. As a result the foxes have thrived amazingly and several hundred skins have been produced a year. With the lessening number of seals now being killed on the islands and the resulting scarcity of winter food, the fate of the foxes is somewhat in doubt. The Pribilof skins are of high market value, bringing from $40 to $150 each in the London market.

Stock from the Pribilofs has been introduced on a number of the Aleutians and other Alaskan islands for fur-farming purposes. The value of these fur-bearers is so great that special effort should be made not only to keep up the stock on the islands, but still further to improve it.

The Pribilof foxes have from five to eleven young, which are usually born above ground and are later carried to the shelter of dens dug in the open or under the shelter of a rock. Foxes have become so accustomed to people on these islands that they have little fear and come about boldly to satisfy their curiosity or to seek for food. They often show an amusing interest in the doings of any one who invades the more remote parts of their domain. White animals born on the islands or coming in by chance when the pack ice touches there in winter are killed, whenever possible, in order to hold the blue strain true.



WHITE, OR ARCTIC, FOX

PRIBILOF BLUE FOX

WOLVERINE (Gulo luscus)

The wolverine, or carcajou of the Canadian voyageurs, is a circumpolar species belonging to the northern forested areas of both continents. In North America it formerly ranged from the northern limit of trees south to New England and New York, and down the Rocky Mountains to Colorado, and down the Sierra Nevada to near Mount Whitney, California. It is a low, squat, heavy-bodied animal, with strong legs and feet armed with sharp claws, and is the largest and most formidable of the weasel family.

The wolverine is extraordinarily powerful and possesses what at times appears to be a diabolical cunning and persistence. It frequently trails trappers along their trap lines, eating or destroying their catches and at times hiding their traps. It is a tireless wanderer, and the hunter or traveler in the northern wilds always has this marauder in mind and is put to the limit of his wits to provide caches for his provisions or other supplies which it can not despoil.

What it can not eat it is likely to carry away and hide. A wolverine has often been known to expend a surprising amount of labor in apparently deliberate mischief, even carrying numerous articles away from camps and hiding them in different places. It sometimes trails a traveler for many miles through winter snow, always out of sight, but alert to take advantage of any carelessness in leaving game or other food unguarded.

Mingled with these mischievous traits the wolverine possesses a savage ferocity combined with a muscular power which renders it a dreaded foe of all but the largest animals of its domain. When guarding her young, the female is no mean foe, even for a man.

As a consequence of its mental and physical character, the wolverine, more than any other animal of the north, has impressed itself on the imagination of both native and white hunters and travelers. A vast amount of folk-lore has grown up about it and both Indians and Eskimos make offerings to propitiate its malignant spirit. The Alaskan Eskimos trim the hoods of their fur garments with a strip of wolverine fur, and Eskimo hunters wear belts and hunting bags made of the skin of the legs and head, that they may acquire some of the power of the animal from which these came.

The value of the handsome brown fur of the wolverine, as well as the enmity the animal earns among hunters and trappers, has resulted in its being so persistently hunted that it has become extinct over much of its former territory, and wherever still found it is much reduced in numbers.

PACIFIC WALRUS (Odobenus obesus)

The walruses, or "sea horses" of the old navigators, are the strangest and most grotesque of all sea mammals. Their large, rugged heads, armed with two long ivory tusks, and their huge swollen bodies, covered with hairless, wrinkled, and warty skin, gives them a formidable appearance unlike that of any other mammal. They are much larger than most seals, the old males weighing from 2,000 to 3,000 pounds and the females about two-thirds as much.

These strange beasts are confined to the Arctic Ocean and the adjacent coasts and islands and are most numerous about the borders of the pack ice. Two species are known, one belonging to the Greenland seas, while the other, the Pacific walrus, is limited to Bering Sea and the Arctic basin beyond Bering Straits.

The Pacific walruses migrate southward through Bering Straits with the pack ice in fall and spend the winter in Bering Sea and along the adjacent coast of eastern Asia. In spring they return northward through the straits and pass the breeding season about the ice pack, where they congregate in great herds. One night in July, 1881, the U. S. steamer *Corwin* cruised for hours along the edge of the ice pack off the Arctic coast of Alaska and we saw an almost unbroken line of walruses hauled out on the ice, forming an extended herd which must have contained tens of thousands.

Walruses were formerly very abundant in Bering Sea, especially about the Fur Seal Islands and along the coast north of the Peninsula of Alaska, but few now survive there. Owing to the value of their thick skins, blubber, and ivory tusks, they have been subjected to remorseless pursuit since the early Russian occupation of their territory and have, as a result, become extinct in parts of their former range and the species is now in serious danger of extermination.

Like many of the seals, walruses have a strong social instinct, and although usually seen in herds they are not polygamous. They feed mainly on clams or other shellfish, which they gather on the bottom of the shallow sea. On shore or on the ice they move slowly and with much difficulty, but in the water they are thoroughly at home and good swimmers. When hauled out on land or ice, they usually lie in groups one against the other. They are stupid beasts and hunters have no difficulty in killing them with rifles at close range.

Walruses have a strongly developed maternal instinct and show great devotion and disregard of their own safety in defending the young. The Eskimos at Cape Vancouver, Bering Sea, hunt them in frail skin-covered kyaks, using ivory- or bone- pointed spears and sealskin floats. Several hunters told me of exciting and dangerous encounters they had experienced with mother walruses. If the young are attacked, or even approached, the mother does not hesitate to charge furiously. The hunters confess that on such occasions there is no option but to paddle for their lives. Occasionally an old walrus is unusually vindictive and, after forcing a hunter to take refuge on the ice, will remain patrolling the vicinity for a long time, roaring and menacing the object of her anger.

When boats approach the edge of the ice where walruses are hauled up, the animals plunge into the sea in a panic and rise all about

WOLVERINE

the intruders, bellowing and rushing about, rearing their huge heads and gleaming white tusks high out of water in an alarming manner. As a rule, however, they are timid and seek only to escape, although occasionally, in their excitement, one has been known to attack a boat and by a single blow of its tusks to do serious damage and endanger the crew.

ALASKA FUR SEAL (Callorhinus alascanus)

Several species of fur seals are known, all of them limited to the southern oceans or the coasts and islands of the North Pacific. All are strongly gregarious and formerly sought their island breeding grounds in vast numbers. At one period, soon after the purchase of Alaska, it was estimated that several million fur seals were on the Pribilof Islands in one season. During the height of their abundance the southern fur seals were equally numerous.

The value of their skins and the facility with which these animals may be slaughtered have resulted in the practical extermination of all but those which breed under governmental protection on the Russian islands off the coast of Kamchatka and on the Pribilof Islands in Alaska. Owing mainly to wasteful pelagic sealing prior to the recent international treaty, the numbers on both these groups of islands were much reduced.

The Alaska fur seal is a migratory species, wintering down the Pacific coast as far as northern California. The migrations of these seals are of remarkable interest. In spring they leave the northwest coast and many of them travel steadily across more than two thousand miles of the North Pacific. For days at a time they swim through a roaring gale-swept sea, under dense, low-hanging clouds, and with unerring certainty strike certain passages in the Aleutian Islands, through which they press to their breeding grounds, more than 100 miles beyond, on the small, fog-hidden Pribilof Islands.

Fur seals are extremely polygamous and the old males, which weigh from 400 to 500 pounds, "haul up" first on the breeding beaches. Each bull holds a certain area, and as the females, only one-fifth his size, come ashore they are appropriated by the nearest bulls until each "beach master" gathers a harem, sometimes containing more than 100 members.

Here the young are born, and after the mating season the seals, which have remained ashore without food from four to six weeks, return to the water. The mothers go and come, and each is able to find her young with certainty among thousands of apparently identical woolly black "pups."

From the ages of one to four years fur seals are extremely playful. They are marvelous swimmers and frolic about in pursuit of one another, now diving deep and then, one after the other, suddenly leaping high above the surface in graceful curves, like porpoises. Squids and fish of various species are their main food. Their chief natural enemy is the killer whale, which follows their migrations and haunts the sea about their breeding grounds, taking heavy toll among them.

Since the discovery of the Pribilof Islands by the Russians the fur seal herds there have yielded more than five million recorded skins. A census of the herds in 1914 gave these islands nearly three hundred thousand seals. Now that pelagic sealing has been suppressed and the herds are being protected, there is every reason to expect that the seals will increase rapidly to something like their former numbers.

STELLER SEA-LION (Eumetopias jubata)

Sea-lions are near relatives of the fur seals and have a nearly similar distribution, both in far southern and northern seas. The males of the several species are more than twice the size of the females and are characterized by an enormous development of neck and shoulders. The Steller sea-lion is the largest member of the group, the old bulls weighing from 1,200 to 1,500 pounds. All are extremely gregarious and polygamous.

The Steller sea-lions belong to the North Pacific, whence they range in winter as far south as the coasts of California and Japan. In spring they migrate northward to their breeding grounds among the Aleutian, Pribilof, and other rocky islands of the North Pacific. The early histories of this region record their great abundance, including several hundred thousand which were reported to have congregated to breed each season on the Pribilof Islands. Although less valuable than the fur-seal, persistent hunting has gradually reduced their numbers on these islands until in 1914 only a few hundred remained.

In summer range they are less limited than the fur seals, occurring in herds about the shores of many rocky islands along the mainland coast of the North Pacific and the Aleutian chain.

Since the primitive days before the arrival of civilized men in their haunts, sea-lions were of the greatest economic importance to the Aleutian Islanders and other coast natives. Food and fuel were obtained from their flesh and blubber; coverings for boats were made of their skins; water-proof overshirts of their intestines; boot soles from the tanned skin of their flippers; trimmings of fancy garments from their tanned gullets and bristles, and thread from their sinews.

They are preëminently animals of the most rugged of shorelines and the stormiest of seas, being superbly powerful beasts with extraordinary vitality. The ease with which they pass through a smother of pounding seas to mount their rugged resting places is an admirable exhibition of skill and strength. The males have a bellowing roar, which rises continually from the herds on the rocks in savage unison with the booming of the sea against the base of their refuge.

The harems of the bulls on Pribilof Islands rarely exceed a dozen members, which are

PACIFIC WALRUS

under less strict discipline than the harems of the fur seals. The old bulls, especially during the mating season, are aggressive and savage fighters, inflicting severe wounds on one another. At all times they are more courageous and belligerent than fur seals, and hunters driving parties of them back from the beach on the Pribilofs approach them with extreme caution, to avoid the dangerous charges of angry bulls. It is reported that an umbrella opened and closed suddenly in the faces of the old sea-lions appears to terrify them more than any other weapon and is used successfully in drives. At sea they have only a single known enemy to fear—the fierce killer whale.

SEA OTTER (Latax lutris and its subspecies)

Sea otters, distant relatives of land otters, are heavy-bodied animals, about 4 feet long, with broad webbed hind feet. When in the water they have a general resemblance to seals, whose mode of life is similar to theirs. Their fur is extremely dense and on the skins of adult males is almost black, closely sprinkled with long white-tipped hairs. The fur of prime skins has a silky luster, equaled in beauty by only the finest silver-tipped fox skins. For centuries sea-otter fur has been highly prized and single skins have brought more than $1,000 in the London market.

Otters are limited to the coasts of the North Pacific, where formerly they were incredibly abundant all the way from the shores and islands of Lower California to the Aleutians, and thence along the Asiatic coast to the Kuriles. Through excessive hunting, they are now extinct along most of this extended coastline.

In the days of the Russian occupation of Alaska the discovery of the abundance of sea otters led to intense activity in their pursuit. Otter-hunting expeditions were organized by the Russians along the storm-swept coast from Unalaska to Sitka, sailing vessels being used as convoys for hundreds of Aleut hunters in their skin-covered boats. The loss of life among the hunters under their brutal taskmasters was appalling and resulted in seriously and permanently reducing the native population of the Aleutian Islands. At the same time enormous numbers of sea-otter skins were taken. Afterward both English and American ships engaged in the pursuit of otters farther down the coast.

The first year after the discovery of the Pribilof Islands the records show that 5,000 sea otters were taken there. Many expeditions in other directions secured from one to several thousand skins. When sea otters were most abundant they were found all down the coast, even in San Francisco Bay, and one American trading vessel obtained 7,000 skins in a few weeks from the natives of the northern coast of Lower California.

The otters formerly frequented the shores of rocky islands and outlying reefs, but constant persecution has driven the few survivors to remain almost constantly at sea, where they seek resting places among kelp beds. They are now excessively shy and, aided by keen eyes and an acute sense of smell, are difficult to approach. When anything excites their curiosity they commonly raise the body upright, the head high above water, and gaze steadily at the object. If alarmed, they dive and reappear at a long distance.

Otter hunters report the animals very playful in pleasant weather, and sometimes floating on their backs and playing with pieces of kelp. The mother is devoted to her young and is said to play with it in the water for hours at a time.

All efforts to rear the young in captivity have failed. The food of the sea otter is mainly of shellfish of various kinds, secured by them from the bottom of the sea.

Practically the only sea otters left among the hordes which once frequented the American shores of the North Pacific are now scattered along the Aleutian Islands. Government regulations prohibit their being hunted and it is hoped that enough still remain to restock the wild and stormy sea where they have their home.

NORTHERN SEA-ELEPHANT, OR ELEPHANT SEAL (Mirounga augustirostris)

Sea-elephants are the largest and among the most remarkable of the seals. Two species are known—one from islands on the borders of the Antarctic Ocean and the other from the Pacific coast of Upper and Lower California. The northern species formerly existed in vast numbers along the coast and among outlying islands from Point Reyes, north of San Francisco, south to Cedros Island, but is now reduced to a single small herd living about Guadalupe Island, off Lower California.

The old males attain a length of 22 feet or more and are huge, ungainly beasts, moving with difficulty on land, but with ease and grace in the water. The name sea-elephant is obviously derived from the broad flexible snout of the males, which, when relaxed, hangs 6 or 8 inches below the muzzle. This curious proboscis can be moved about and raised vertically, giving the animal a strange appearance. The males have a loud roar like the bellowing of an ox.

The breeding season extends from February to June, and during this period these seals are far more numerous on shore than at any other time. They are gregarious in habits and formerly hauled up in herds on the islands or on remote and inaccessible beaches of the mainland. On shore they are sluggish, having none of the alertness shown by many other seals. They lie supine on the sand and permit a man to walk quietly up and touch them without showing signs of fear. When attacked by sealers or otherwise alarmed, however, they become panic-stricken and make ungainly efforts to escape, but quickly become exhausted by the exertion necessary to move their great



ALASKA FUR SEAL



STELLER SEA-LION

bodies. Their only natural enemy appears to be the killer whale.

Between 1855 and 1870 the great numbers of northern sea-elephants, combined with their helplessness on shore and the value of their oil, attracted numerous sealing and whaling ships to the coast of Lower California. The resulting slaughter reduced these animals from swarming abundance to a few scattered herds. Since then their numbers have steadily decreased, and there is a serious probability that these strange and interesting habitants of the sea will soon disappear forever.

The small remaining herd on Guadalupe Island is without protection and lies at the mercy of wanton hunters. The people of the coastal towns of California should exert themselves to discourage hunters from killing these seals, since the only hope for the preservation of this noteworthy species lies in an awakened public sentiment in its favor. Even within recent years they have occasionally visited the Santa Barbara Islands, California, and if the existing survivors can be saved they may again become resident there.

HARBOR SEAL, OR LEOPARD SEAL (Phoca vitulina)

The harbor seal, one of the smallest of the hair seals, attaining a length of only 5 or 6 feet, is one of the most widely distributed and best known of its kind. It is a circumpolar species, formerly ranging well south on the European coast and to the Carolinas on the American side of the Atlantic, though now more restricted in its southern extension. On the North Pacific it ranges south to the coast of Japan on the Asiatic side and to Lower California on the American side.

Throughout its range the harbor seal haunts the coast-line, frequenting rocky points, islets, bays, harbors, and the lower courses of rivers. It commonly frequents the sandy bars exposed at low tide about the mouths of rivers, and has been known to ascend the St. Lawrence to Lake Champlain and Lake Ontario, and the Yukon to several hundred miles above its mouth. It is still a common and well-known animal on the coast of Maine and eastern Canada and about many harbors on the Pacific coast. It appears to be a non-migratory species and in northern waters frequents the pack ice along shore in winter. Where the pack is unbroken, the seal makes breathing holes through the ice, which it visits at intervals, and where it is hunted by the Eskimos.

It is not polygamous and is not so strongly gregarious as some of the other seals. That it has some social instinct is evident, however, since it commonly gathers in small herds on the same sand spits, rocky points, and islets. The young are born in early spring and at first are entirely covered with a woolly white coat. The mother is devoted to the "pup" and shows the deepest anxiety if danger threatens.

The flesh and blubber of this seal are highly prized by the Eskimos as the most palatable of all the seals, and the skin is valued for clothing and for making strong rawhide lines used for nets and other purposes. On the Alaskan coast of Bering Sea in fall the Eskimos capture many seals in nets set off rocky points, just as gill nets are set in the same places in spring for salmon.

Owing to the presence of this seal along so many inhabited coasts, much has been written concerning its habits, especially as observed about the shores of the British Isles. Where not disturbed it shows little fear and will swim about boats or ships, raising its head high out of water and gazing steadily with large intelligent eyes at the object of its curiosity; but when hunted it becomes exceedingly shy and wary. All who have held the harbor seal in captivity agree in praising its intelligence. It becomes very docile, often learning a variety of amusing tricks, and develops great affection for its keeper.

The small size of this seal and its limited numbers are elements which save it from extensive commercial hunting and may preserve it far into the future to add life and interest to many a rocky coast.

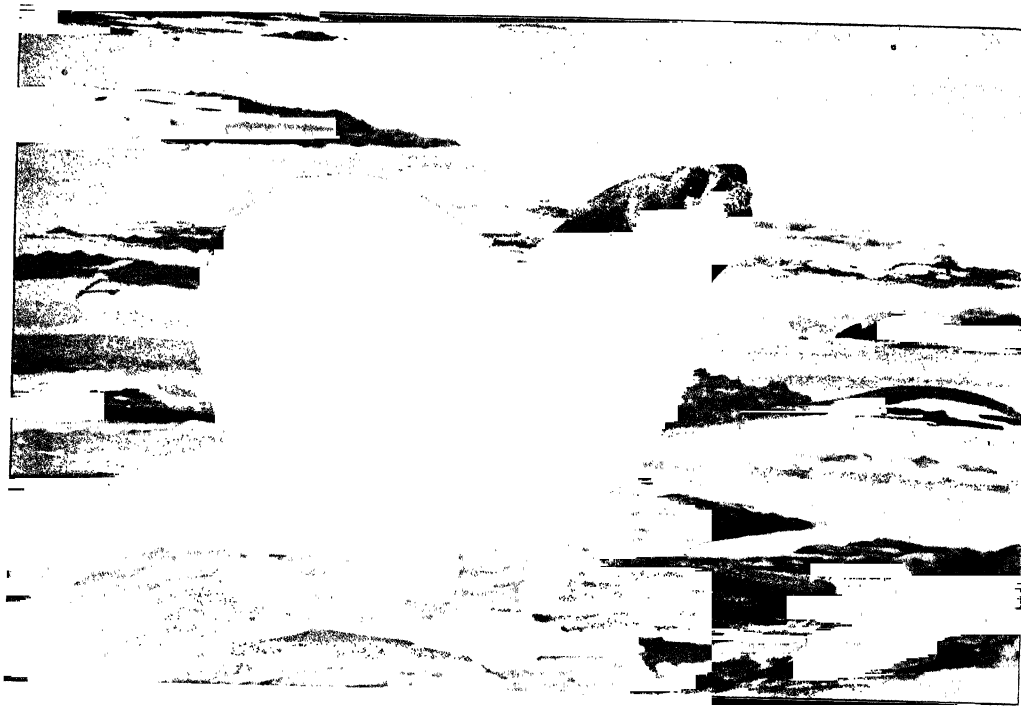
HARP SEAL, SADDLE-BACK, OR GREENLAND SEAL (Phoca grœnlandica)

The black head, gray body, and large dorsal ring of the male harp seal are strongly distinctive markings in a group generally characterized by plain dull colors. The harp seal is a large species, the old males weighing from 600 to 800 pounds.

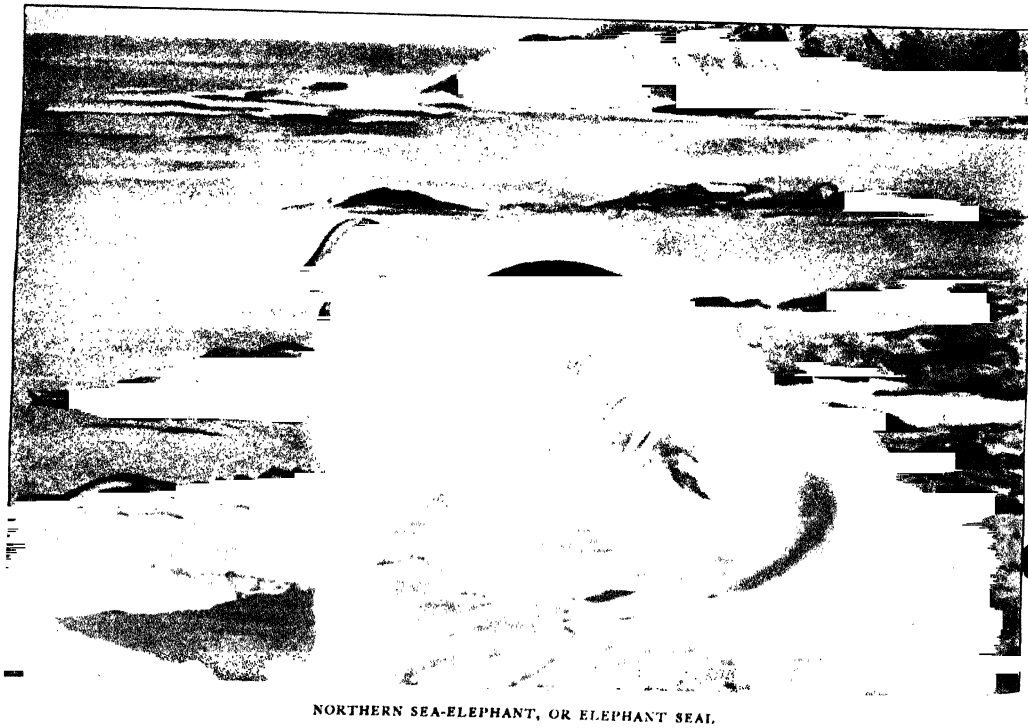
It is nearly circumpolar in distribution, but its area of greatest abundance extends from the Gulf of St. Lawrence to Greenland, and thence eastward in that part of the Arctic Ocean lying north of Europe and western Siberia. Its reported presence in the Arctic basin north of Bering Straits or along the coasts to the southward is yet to be confirmed. It is an offshore species, migrating southward with the ice pack in fall to the coast of Newfoundland and returning northward with the pack after the breeding season in spring. For a day or two during the fall migration, when these seals are passing certain points on the coast of Labrador, the sea is said to be thickly dotted with their heads as far as the eye can reach, all moving steadily southward.

The harp seal is extremely gregarious and gathers on the pack ice well offshore during March and April to breed. The main breeding grounds are off Newfoundland and off Jan Mayen Land in the Arctic. During the breeding season, in the days of their abundance, they gathered in enormous closely packed herds, sometimes containing several hundred thousand animals and covering the ice for miles.

From all accounts it is evident that originally there were millions of these animals in the North Atlantic and Arctic Oceans. Their gregarious habits made them an easy prey, and the value of their skins and blubber formed



SEA OTTER



NORTHERN SEA-ELEPHANT, OR ELEPHANT SEAL

the basis for a great industry. Hundreds of vessels were sent out from north European and American ports and nearly 1,000,000 harp seals were killed during each breeding season. This tremendous slaughter and its attendant waste has resulted in the disappearance of these seals from many of their former haunts and has alarmingly reduced their numbers everywhere. Some are still killed off the coast of Newfoundland, but the sealing industry, now insignificant as compared with its former estate, is practically dead.

The hunting of harp and other seals on the pack ice is an occupation calling for such splendid qualities of virile hardihood in the face of constant danger to life that its brutality has been little considered. In this perilous work great numbers of hunters have been cast away and frozen miserably on the drifting ice and many a sealing ship has been lost with all hands.

Off Newfoundland the young harp seal is born early in March, wearing a woolly white coat. At first it is tenderly cared for by its mother, but before the end of April it has learned to swim and is left to care for itself. The young do not enter the water until they are nearly two weeks old and require several days of practice before they learn to swim well. The adults are notable for their swiftness in the water. In the tremendous herds of these seals the continual cries uttered by old and young is said to produce a steady roar which may be heard for several miles. Their food is mainly fish. Man is their worst enemy, but they are also preyed upon by sharks and killer whales.

RIBBON SEAL (Phoca fasciata) (see polar bear group, page 438)

The broad-banded markings of the male ribbon seal render it the handsomest and most strongly characterized of the group of hair seals to which it belongs. Its size is about that of the harbor seal. Its range extends from the Aleutian Islands, on the coast of Alaska, and from the Kuriles, on the Asiatic shore of the Pacific, north to Bering Straits.

This seal is so scarce and its home is in such remote and little-frequented waters that its habits are almost unknown. Apparently it is even less gregarious than the harbor seal and usually occurs singly, although a few may be seen together, where individuals chance to meet. There are records of its capture at various places along the Asiatic coast, especially about Kamchatka and the shores of Okhotsk Sea. In Alaska it is a scarce visitant to the Aleutian Islands and appears to be most common on the coast south of the Yukon Delta and from Cape Nome to Bering Straits.

The few individuals taken by the Alaskan Eskimos are captured while they are hunting other seals on the pack ice in winter, and while at sea in kyaks in spring and fall. Owing to its attractive markings, the skin of the male ribbon seal is greatly prized by the Eskimos, as it was formerly by the fur traders, for use as clothes-bags. The skin is removed entire and then tanned, the only opening left being a long slit in the abdomen, which is provided with eyelet holes and a lacing string, thus making a convenient water-proof bag to use in boat or dog-sledge trips.

The scarcity of the ribbon seal and its solitary habits will serve to safeguard it from the destructive pursuit which endangers the existence of some of its relatives.

POLAR BEAR (Thalarctos maritimus)

Both summer and winter the great ice bear of the frozen north is appropriately clothed in white. It is also distinguished from all other bears by its long neck, slender pointed head, and the quantity of fur on the soles of its feet. It is a circumpolar species, the limits of whose range nearly everywhere coincide with the southern border of the pack ice. The great majority live permanently on the ice, often hundreds of miles from the nearest land.

During summer the polar bear rarely visits shore, but in winter commonly extends its wanderings to the Arctic islands and the bordering mainland coasts. In winter it ranges southward with the extension of the ice pack. In spring, by an unexpectedly sudden retreat of the ice, individual bears are often left south of their usual summer haunts, sometimes being found swimming in the open sea far off the coast of Labrador. Occasionally some of those which migrate southward with the ice through Bering Straits fail to turn north early enough and are stranded on islands in Bering Sea.

That a carnivore requiring so much food as the polar bear can maintain itself on the frozen polar sea is one of the marvels of adaptation to environment. The activity of these bears through the long black night of the far north is proved by records of Arctic explorers, whose caches have been destroyed and ships visited by them during that season. In this period of privation they range far over land and ice in search of food, and when in desperate need do not hesitate to attack men. I have seen several Eskimos who had been seriously injured in such encounters, and learned of other instances along the Arctic coast of Alaska in which hunters had been killed on the sea ice in winter. During the summer season of plenty, polar bears are mild and inoffensive, so far as men are concerned. At that time they wander over the pack ice, swimming in open leads, and, when hungry, killing a seal or young walrus.

When spring opens, many polar bears are near the Arctic coast. At that time the natives along the northeast coast of Siberia kill many of them on the ice with dogs and short-hafted, long-bladed lances. The dogs bring the bear to bay, and the hunter, watching his opportunity, runs in and thrusts the lance through its heart.

During the cruise of the *Corwin* we saw many of these bears on the broken ice off Herald and Wrangel Islands. One large old male



HARBOR SEAL, OR LEOPARD SEAL

HARP SEAL, SADDLE-BACK, OR GREENLAND SEAL

climbed to the top of an uptilted ice-pan and, after looking about, lay down on one side and, giving a push with one hind foot, slid down head foremost 30 or 40 feet, striking the water with a great splash. He then climbed out and walked sedately away.

Another bear saw a seal basking on the ice by a large patch of open water and, swimming across, suddenly raised himself half out of the water to the edge of the ice, and by a blow of his paw crushed the seal's skull. He then climbed out and made a feast within 500 yards of where the *Corwin* was anchored to the ice pack.

Once while we were anchored in a dense fog several miles off the pack a bear came swimming out to us, stopping every now and then to raise its head high out of water to sniff the attractive odors from the ship. Although strong and tireless swimmers, these bears lack the necessary speed to capture their prey in the water.

The female retires in winter to a snug den among the hummocks on the sea ice, where one or two naked cubs are born, which by the time the ice begins to break up are ready to follow the mother. Until the cubs are well grown the mother cares for and defends them with the most reckless disregard for her own safety. On one occasion I saw a wounded mother bear shield her cub, twice the size of a Newfoundland dog, when bullets began to strike the water about them, by swimming straight away with the cub safely sheltered between her forelegs.

The inaccessible character of so large a part of the home of the polar bear will long preserve it from the extermination that is overtaking some of the land bears.

BLACK BEAR (Ursus americanus and its subspecies)

Numerous species of black bears varying in size occur in North and South America and in Asia. In North America a black bear, remarkably uniform in general appearance, but representing various geographic races and possibly species, is generally distributed throughout the forested areas from the borders of the Arctic barrens, at the northern limit of trees, south throughout the United States and down the wooded Sierra Madre to Jalisco, Mexico, and from Newfoundland on the east to Queen Charlotte Island on the west.

These bears are usually entirely black except for a brown patch covering the muzzle and an occasional white spot on the breast. Their weight is variable, the largest ones exceeding 500 pounds, but they average much less.

The cinnamon bear, so common in the West and Northwest, long supposed to be a distinct species, has proved to be merely a color phase of the black bear—cinnamon cubs being born in the same litters with black ones.

Since the days of primitive man and the great cave bear, the ways of bears have had a fearsome interest to mankind. Childhood revels in the delicious thrills of bear stories and dwells with wonder on the habit bears have of standing upright like droll caricatures of man, on the manlike tracks of their hind feet, and on their fondness for sweets and other palatable food.

From the landing of the first colonists on our shores, hunters and settlers have encountered black bears so frequently that these are among the best-known large forest animals of the continent. During winter they hibernate for months, seeking a hollow tree, a low cave, the half shelter of fallen tree trunks and brush, or else digging a den for themselves. The female chooses a specially snug den, where in midwinter from one to four cubs are born. At birth the young, only 8 or 9 inches long, are practically naked and have their eyes closed. They are so undeveloped at this time that it is more than a month before their eyes open and more than two months before they can follow their mother.

Although powerful beasts, black bears are so shy and timid that to approach them requires the greatest skill on the part of a still hunter. They only attack people when wounded or so cornered that they must defend themselves or their young. To safeguard themselves from danger they rely mainly on a fine sense of hearing and an exquisite delicacy of smell. They have poor eyesight, and where a suspicious object is seen, but no sound or scent can be noted, they sometimes rise on their hind feet and look long and carefully before retreating.

To bears in the forest everything is game. They often spend the entire day turning over stones to lick up the ants and other insects sheltered there, and at night may visit settlers' cabins and carry off pigs. They raid the settlers' cornfields for green corn and are passionately fond of honey, robbing bee trees whenever possible. In season they delight in wild cherries, blueberries, and other fruits, as well as beechnuts, acorns, and pinyon nuts. They are mainly nocturnal, but in districts where not much disturbed wander widely by day.

The success of black bears in caring for themselves is well demonstrated by the numbers which still survive in the woods of Maine, New York, and other long-settled States. Their harmlessness and their exceeding interest to all render them worthy of careful protection. They should be classed as game and thoroughly protected as such except for certain open seasons. If this is done throughout the country, as is now the case in certain States, the survival of one of our most characteristic large wild animals will be assured.

GLACIER BEAR (Ursus emmonsi)

When first discovered the glacier bear was supposed to be a distinct and well-marked species. Recently cubs representing the glacier bear and the typical black bear have been found in the same litter, thus proving it to be merely a color phase of the black bear. Its color varies exceedingly, from a light smoky,



RIBBON SEAL

POLAR BEAR

almost bluish, gray to a dark iron gray, becoming almost black. Some individuals are extraordinary appearing beasts, quite unlike any other bear. The interest in this curious color development is increased by its restricted distribution.

The glacier bear is an Alaskan animal, which occupies the seaward front of the Mount St. Elias Range, about Yakutat Bay, and thence southeast to Glacier Bay and a short distance beyond toward the interior. The popular name of this bear was well chosen, as its home is in the midst of innumerable stupendous glaciers. Here, where the contours of gigantic mountain ranges are being steadily remade by glaciers, Nature appears to have begun the evolution of a new kind of bear. That the task is in progress is evidenced by the excessive variation in color, scarcely two individuals being the same.

The food of this bear consists largely of mice, ground squirrels, and marmots, which it digs from their burrows on the high mountain slopes. Its food is varied by salmon during the spawning season and by various herbs and berries during the summer. The winters in the home of the glacier bear are less severe than across the range in the interior, but are so long and stormy that the bear must spend more than six months each year in hibernation.

Owing to the remote and little-frequented region occupied by this bear, little is known of its life history. For this reason it is important that all sportsmen visiting its country bring back careful and detailed records of their observations. Up to the present time so few white men have killed glacier bears that a skin of one taken by fair stalking is a highly prized trophy. As the glacier bear country becomes more accessible, more stringent protection will be needed to prevent the extermination of these unique animals.

GRIZZLY BEAR (Ursus horribilis and its relatives)

Recent research has shown that the popular terms grizzly or silver-tip cover a group containing numerous species of large bears peculiar to North America, some of which, especially in California, have become extinct within the last 25 years. These bears vary much in size, some about equaling the black bear and others attaining a weight of more than 1,000 pounds. They vary in color from pale dull buffy to nearly black, usually with lighter tips to the hairs, which produce the characteristic grizzled or silver-tipped appearance upon which the common names are based.

The strongest and most distinctive external character of the grizzlies is the long, proportionately slender, and slightly curved claws on the front feet, sometimes more than 3 inches long.

Grizzly bears have a wide range—from the Arctic coast of Alaska southward, in a belt extending from the Rocky Mountains to the Pacific, through western Canada and the United States, and thence along the Sierra Madre of Mexico to southern Durango. They also occupy the barren grounds of northern Canada, and vague reports of a large brown bear in the interior of the Peninsula of Labrador indicate the possibility of the existence there of an unknown species of grizzly.

From the days of the earliest explorers of the Rocky Mountain region grizzly bears have borne the undisputed title of America's fiercest and most dangerous big game. In early days, having little fear of the primitive weapons of the Indians, they were bold and indifferent to the presence of man, and no higher badge of supreme courage and prowess could be gained by a warrior than a necklace of grizzly claws.

Since the advent of white men with guns, conditions have changed so adversely to the grizzlies that they have become extremely shy, and the slightest unusual noise or other alarm causes them to dash away at a lumbering, but surprisingly rapid, gallop. The deadly modern gun has produced this instinctive reaction for self-preservation. It does not mean, however, that grizzlies have lost their claim to the respect of even the best of hunters. They are still considered dangerous, and even in recent years experienced hunters have been killed or severely mauled by them. They are much more intelligent than the black bear, and thus, when wounded, are a more dangerous foe.

Like the black bear, the grizzlies are commonly nocturnal, but in remote districts often wander about in search of food by day. They roll over stones and tear open rotten wood in search of grubs and insects. They also dig out ground squirrels and other rodents and eat a variety of acorns and other wild nuts and fruits. As an offset to this lowly diet, many powerful old grizzlies, from the Rocky Mountains to California, have become notorious cattle-killers. They stalk cattle at night, and, seizing their prey by the head, usually break its neck, but sometimes hold and kill it by biting. These cattle-killing grizzlies still occur on the Western ranges. One or more wily marauders of this kind have run for years with a bounty of $1,000 on their heads.

Like other bears, grizzlies hibernate in winter, seeking small caves, or other shelter, and sometimes digging a den in the ground. The young, from one to four in number, are born in midwinter and are very small, naked, and but partly developed at birth. They go about with the mother throughout the summer and commonly den up with her the following winter. Although full-grown grizzlies are ordinarily solitary in habits, parties of from four to eight are sometimes seen. The object of these curious but probably brief companionships is not known.

Grizzlies are disappearing so rapidly that it is very desirable that they be placed on the list of game protected during part of the year, except in the case of the few individuals which become stock-killers. They are among the finest of native animals and their absence from the rugged slopes of the western mountains would leave a serious gap in our wild life.

ALASKAN BROWN BEAR (Ursus gyas and its relatives)

(See frontispiece of this Magazine for the illustration of this remarkable animal)

The Alaskan brown bears form a group of gigantic animals peculiar to North America and limited to the coast and islands of Alaska, from the head of Norton Sound to the Sitka Islands. The group includes a number of species, individuals of two of which, *Ursus gyas*, of the Alaska Peninsula, and *Ursus middendorffi*, of Kodiak Island, sometimes attain a weight of 1,500 pounds or more, and are not only the largest existing bears, but are the largest living carnivores in the world. They can be likened only to the great cave bears, which were the haunting terror of primitive mankind during the "Old Stone Age" in Europe. Brown bears still exist in Europe and Asia, but they form a distinct group of much smaller animals than the American species.

The Alaskan brown bears vary much in color, from a dull golden yellowish to a dusky brown, becoming almost black in some species. In color some of the darker species are indistinguishable from the great grizzlies, with which in places they share their range; but the relatively shorter, thicker, and more strongly curved claws on the front feet of the brown bears are distinctive.

As a rule they are inoffensive giants and take flight at the first sign of man. The taint left by a man's recent track or the faintest odor on the passing breeze, indicating the proximity of their dreaded enemy, is enough to start the largest of them in instant flight. Instances are reported of their having attacked people wantonly, but such cases are extremely rare. When wounded or suddenly surprised at close quarters, the instinct of self-defense not infrequently incites them to attack their enemy with furious energy. Many Indian and white hunters have been killed or terribly mauled by them in such encounters. At close quarters their great size, strength, and activity—astonishing for such apparently clumsy beasts—render them terrific antagonists.

Some of the species occupy open, rolling, or hilly tundras, and others live on the steepest and most rugged mountain slopes amid glaciers, rock slides, and perpetual snow-banks. On the approach of winter all retreat to dry locations, usually in the hills, where they dig dens in the earth or seek other cover to which they retire to hibernate, and here the young, usually two or three in number, are born. They usually emerge from hibernation in April or early May and wander about over the snow-covered hills and mountains. At this time their dark forms and their great tracks in the snow are so conspicuous that hunters have little difficulty in finding them.

Despite their size, brown bears devote much of their time to hunting such game as mice, ground squirrels, and marmots, which they dig from their burrows with extraordinary rapidity. During the salmon season, when the streams swarm with fish, bears frequent the lowlands and make trails along the watercourses, where they feed fat on this easy prey. During the summer and fall these great carnivores have the strange habit of grazing like cattle on the heavy grasslike growth of sedge in the lowland flats and benches, and also of eating many other plants.

Although Alaska was long occupied by the Russians and has been a part of our territory since 1867, not until 1898 was there any definite public knowledge concerning the existence of these bears, notwithstanding their size and abundance. Since that time they have become well known to sportsmen and others as one of the wonders of the remarkable region they occupy. Their comparatively limited and easily accessible territory renders their future precarious unless proper measures for their reasonable protection are continued. They are certain to be exterminated near settlements; but there are ample wild and inhospitable areas where they may range in all their original freedom for centuries to come, provided man permits.

AMERICAN BEAVER (Castor canadensis and its subspecies)

When North America was first colonized, beavers existed in great numbers from coast to coast, in almost every locality where trees and bushes bordered streams and lakes, from near the Yukon Delta, in Alaska, and the Mackenzie Delta, on the Arctic coast, south to the mouths of the Colorado and the Rio Grande. Although now exterminated from most of their former range in the eastern United States, they still occur in diminished numbers over nearly all the remainder of their original territory, even in the lower Rio Grande and the delta of the Colorado. Their vertical distribution extends from sea-level to above an altitude of 9,000 feet.

Beavers are heavily built, round-bodied animals, with powerful chisel-shaped front teeth, short legs, fully webbed hind feet, and a flat, scaly tail. They are covered with long, coarse hairs overlying the short, dense, and silky underfur to which beaver skins owe their value. Their range covers the northern forested parts of both Old and New Worlds. The American species closely resembles in general appearance its Old World relative, but is distinctly larger, averaging 30 to 40 pounds in weight, but sometimes attaining a weight of more than 60 pounds. Owing to the different physical conditions in its wide range, the American animal has developed a number of geographic races.

Beavers mate permanently and have from two to five young each year. Their abundance and the high value of their fur exercised an unparalleled influence on the early exploration and development of North America. Beaver skins were the one ready product of the New World which the merchants of Europe were eager to purchase. As a consequence competition in the trade for these skins was the source of strong and bitter antagonisms be-



GRIZZLY BEAR



AMERICAN BEAVER

tween individuals and companies, and even caused jealous rivalries among the Dutch, English, and French colonies.

Disputes over the right to trade in certain districts often led to bloodshed, and even to long wars, over great areas, where powerful rival companies fought for the control of a new empire. This eager competition among daring adventurers resulted in the constant extension of trading posts through the North and West, until the vanguard of civilization reached the far borders of the continent on the shores of the Arctic and Pacific Oceans.

Among the fur traders the beaver skin became the unit of value by which barter was conducted for all sorts of commodities. This usage extended even throughout northern Alaska, where it was current among the American fur traders until the discovery of gold there upset old standards.

Beavers belong to the rodent family—a group of animals notable for their weak mental powers. The beaver is the striking exception to the rule, and its extraordinary intelligence, industry, and skill have long excited admiration. It is scarcely entitled to the almost superhuman intelligence many endow it with, yet it certainly possesses surprising ability along certain lines. Furthermore, it can alter its habits promptly when a change in environment renders this advantageous.

In wild places, where rarely disturbed, beavers are unsuspicious, but where they are much trapped they become amazingly alert and can be taken only by the most skillful trapping. They are very proficient in building narrow dams of sticks, mud, and small stones across small streams for the purpose of backing up water and making "beaver ponds." In the border of these ponds a conical lodge is usually constructed of sticks and mud. It is several feet high and about 8 or 10 feet across at the base.

The entrance is usually under water, and a passageway leads to an interior chamber large enough to accommodate the pair and their well-grown young. From the ponds the animals sometimes dig narrow canals several hundred feet long back through the flats among the trees. Having short legs and heavy bodies, and consequently being awkward on land, beavers save themselves much labor by constructing canals for transporting the sticks and branches needed for food and for repairing their houses and dams.

Along the Colorado, lower Rio Grande, and other streams with high banks and variable water level, beavers usually dig tunnels leading from an entrance well under water to a snug chamber in the bank above water level. Under the varying conditions in different areas they make homes showing every degree of intergradation between the two types described.

Beavers live almost entirely on twigs and bark, and their gnawing powers are surprising. Where small trees less than a foot in diameter abound they are usually chosen, but the animals do not hesitate to attack large trees. On the headwaters of the San Francisco River, in western New Mexico, I saw a cottonwood nearly 30 inches in diameter that had been felled so skillfully that it had fallen with the top in the middle of a small beaver pond, thus assuring an abundance of food for the animals at their very door.

In the cold northern parts of their range, where streams and ponds remain frozen for months at a time, beavers gather freshly cut green twigs, sticks, and poles, which they weight down with mud and stones on the bottoms of ponds or streams near their houses, to be used for food during the shut-in period.

The mud used by beavers in building dams and houses is scooped up and carried against the breast, the front feet being used like hands. The flat tail serves as a rudder when the animal is swimming or diving, and to strike the surface of the water a resounding slap as a danger signal.

Beavers are usually nocturnal, but in districts where not disturbed they sometimes come out to work by day, especially late in the afternoon. Among the myriads of small streams and lakes in the great forested area north of Quebec they are very plentiful; their dams and houses are everywhere, sometimes four or five houses about one small lake. Their well-worn trails lead through the woods near the lake shores and frequently cross portages between lakes several hundred yards apart.

Where beavers continue to occupy streams in settled districts, they often make regular trails from a slide on the river bank back to neighboring cornfields, where they feast on the succulent stalks and green ears. They also injure orchards planted near their haunts, by girdling or felling the trees. Within recent years laws for their protection have been passed in many States, and beavers have been reintroduced in a number of localities. They should not be colonized in streams flowing through lands used for orchards or cornfields, nor where the available trees are too few to afford a continuous food supply.

FISHER, OR PEKAN (Mustela pennanti)

The fisher is one of the largest and handsomest members of the weasel family. Like others of this group, it is a long-bodied, short-legged animal. It attains an extreme length of from 3 to 3½ feet and a weight of 18 or 20 pounds, but the average is decidedly lower than these figures. In general, it is like a gigantic marten, and from its size and dark color is sometimes known locally as the "black cat" or "black fox."

It lives in the forested parts of Canada and the United States, where it originally occurred from the southern shores of Hudson Bay and Great Slave Lake south throughout most of eastern Canada and New England and along the Alleghanies to Tennessee; also in the Great Lakes region, south to the southern end of Lake Michigan; along the Rocky Mountains to Wyoming, down the Cascades to northern California, and from the Atlantic coast of Nova Scotia and Maine to the Pacific coast of southeastern Alaska and British Columbia. They

still occur regularly in the Adirondacks of New York and the Green Mountains of Vermont and in Maine, but are gone from most of the southern border of their former range.

Fishers are powerful and agile animals, probably for their size by far the swiftest and most deadly of all our forest carnivores. So swift and dextrous are they in the tree-tops that they not only capture squirrels without difficulty, but are able to overtake and kill the marten, almost an incredible feat. When in pursuit of their prey or when alarmed, they make astonishing leaps from tree to tree. While not so speedy on the ground as some other animals, they have the tireless persistence of their kind and capture snowshoe hares in fair chase.

Among the habitants of the forest the fisher is a fearless and savage marauder, which feeds on frogs, fish, and nearly every bird and mammal its domain affords, except species so large that their size protects them. Porcupines are among its favorite victims and are killed by being turned over and attacked on their underparts. As a consequence of such captures, the fisher often has many quills imbedded in its head and the foreparts of its body.

The fisher, like many other predatory animals, has more or less regular "beats" along which they make their rounds over the territory each occupies. These rounds commonly require several days to accomplish. In winter they keep mainly along wooded ridges, where they are trapped.

It follows trap lines like the wolverine and eats the bait or the captured animal, but, unlike the wolverine, appears to have no propensity for further mischief. When overtaken by dogs or when at war with any of its forest rivals, it is so active and ferocious that it is worthy all due respect from antagonists several times its size.

Although essentially a tree animal, much of the fisher's time is spent on the ground. In summer it appears to be fond of heavy forests in low-lying situations and the vicinity of water. Its dens are usually located in a hollow high up in a large tree, but sometimes in the shelter of fallen tree trunks or crevices in the rocks, where, the last of April or early in May, the young are born. These may number from one to five, but are usually two or three. The young begin to follow the mother in her wanderings when quite small and do not leave her guardianship until nearly grown.

The fisher is not a common animal and only about 8,000 of its skins are marketed each year. Owing to its size, it is conspicuous, and its very fearlessness tends to jeopardize its existence. It is gone from most of the southern part of its former range and will no doubt continue steadily to lose ground with the increasing occupation of its haunts.

OTTER (Lutra canadensis and its relatives)

Land otters are common throughout a large part of the Old World, and when America was explored the animals were found generally distributed, and sometimes common, from the northern limit of trees in North America to southern South America. Within this great area a considerable number of species and geographic races of otters occur, all having a close general resemblance in appearance and habits.

The Canadian otter is the well-known type throughout the United States, Canada, and Alaska. It is a slender, dusky brown animal, from 4 to 5 feet in length, frequenting streams and lakes which contain a good supply of fish. Otters are too short-legged to move easily on land, but are remarkable for their admirable grace, agility, and swiftness in the water. Although so poorly adapted to land travel, they are restless animals, constantly moving up and down the streams in which they live and often crossing from one stream to another. In the far north in midwinter they travel surprising distances across snow-clad country, following the banks of streams or passing between them searching for an entrance to water, whether through the ice or in open rapids.

In Alaska I saw many otter trails in the snow crossing the Yukon and through the adjacent forest. In such journeys it was evident that the animals progressed by a series of long bounds, each leaving a well-marked, full-length impression in the snow, so characteristic that it could not be mistaken. These trails, often leading for miles across country, always excited my deepest interest and wonder as to how these animals could succeed in finding holes through the ice in this vast snow-bound waste. Nevertheless they seemed to know full well, for the trails always appeared to be leading straight away for some known objective.

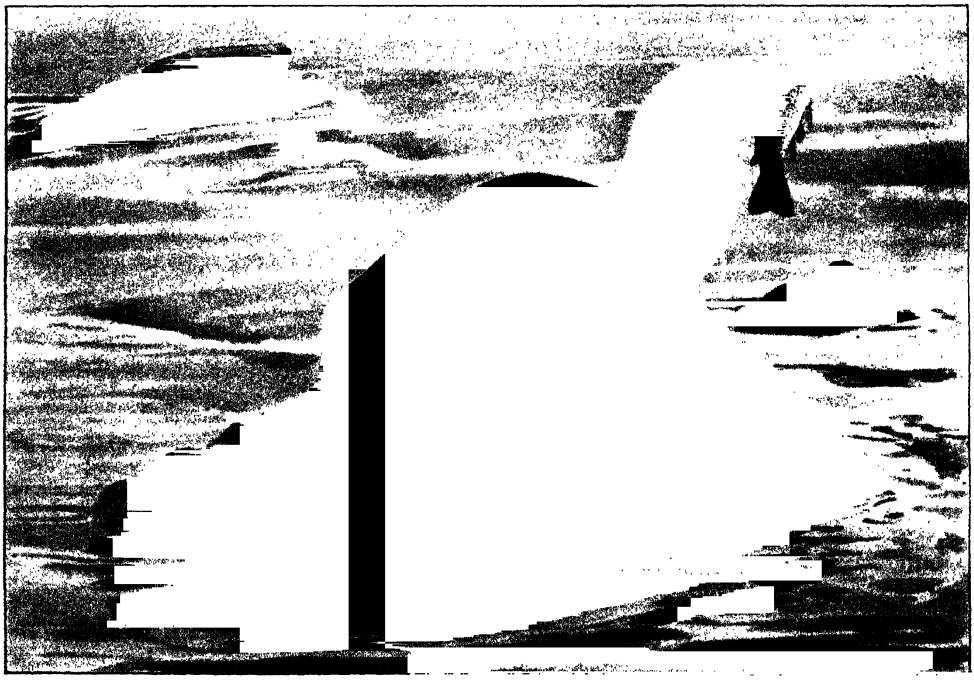
Although never very abundant, otters are so shy and solitary in their habits that they have managed to retain almost all of their original range. They occur now and then in the Potomac, near Washington, and in other rivers throughout the country, where their tracks may occasionally be detected on sand-bars and in the muddy shallows along the banks. A sight of the animals themselves is rare. Their dens are usually in the banks of streams or lakes above or below the surface of the water, under the roots of large trees, or beneath rocky ledges.

Otters are extremely playful and amuse themselves by sliding down steep banks into the water, repeatedly using the same place until a smooth chute or "slide" is defined. They usually have two to five young, which remain with the mother until nearly grown.

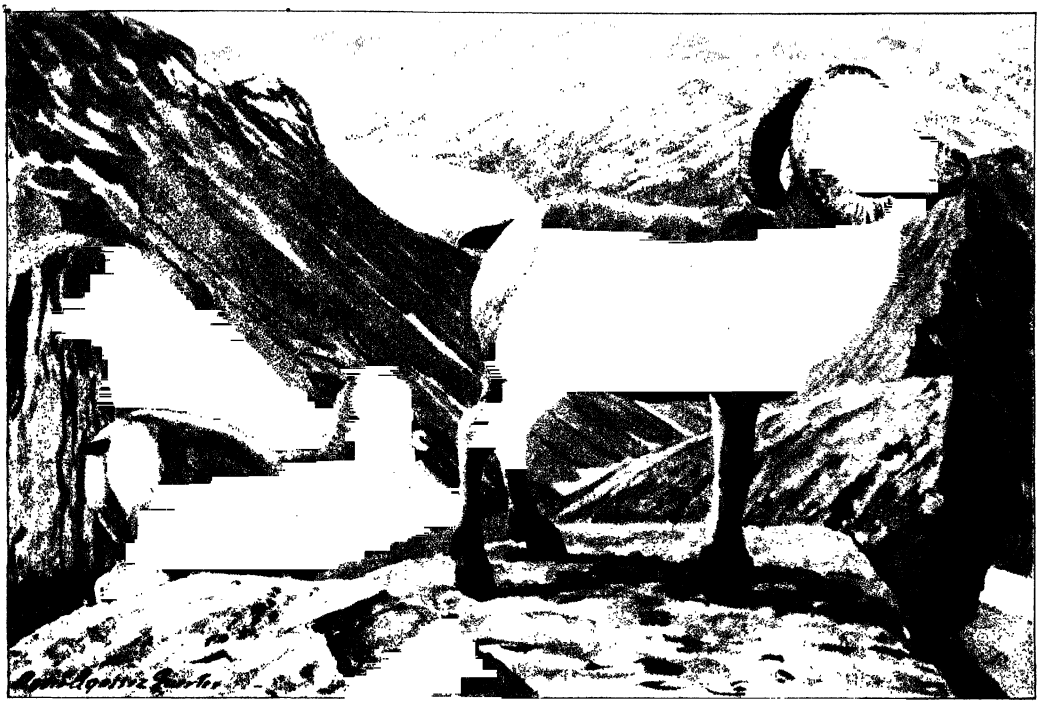
While close relatives of the weasel, they are much more intelligent, have a gentler disposition, and make playful and most interesting pets. Their fur is highly prized and always brings a good price in the market. As a result, they have been persistently hunted and trapped since our pioneer days. That the species should continue to exist, though in much diminished numbers, throughout most of its original range is a striking evidence of its retiring habits and mental acuteness.



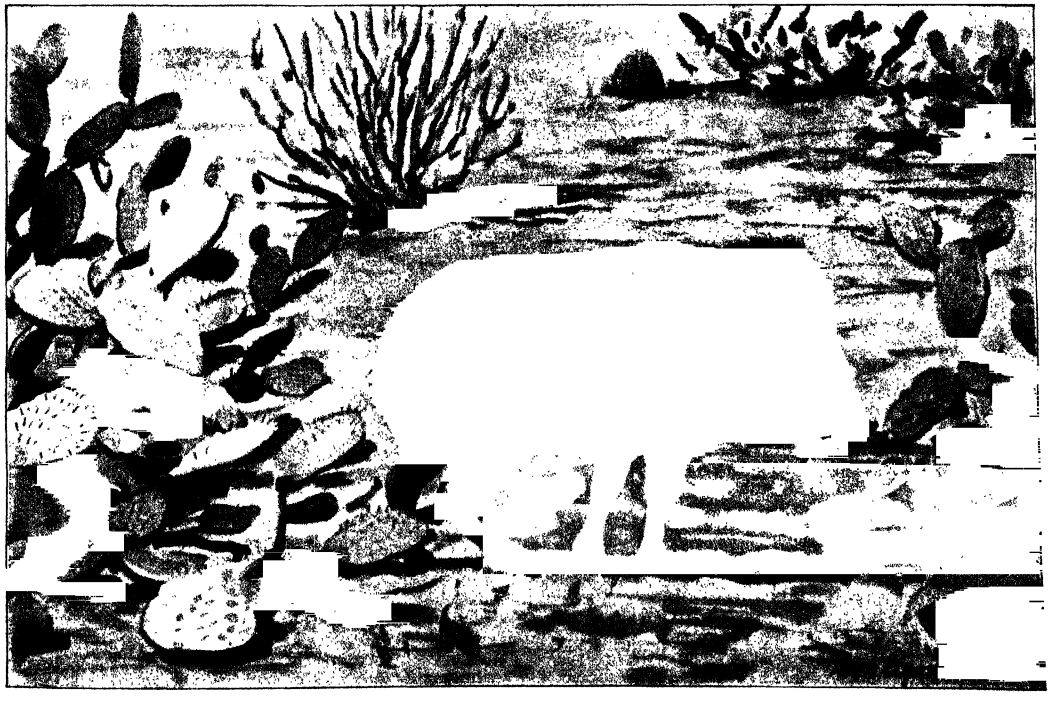
FISHER, OR PEKAN



OTTER



ROCKY MOUNTAIN SHEEP



COLLARED PECCARY, OR MUSKHOG

COLLARED PECCARY, OR MUSKHOG (Pecari angulatus)

The numerous and extraordinarily varied species of wild pigs of the Old World are represented in America by the peccaries, a specialized group containing two species of small pigs peculiar to North and South America. One of the many differences between them and their Old World relatives is their having but two young. The name muskhog, applied to them, is based on their possession of a large gland, located high up on the middle of the rump, which emits a powerful odor. The musky odor from this quickly permeates the flesh of a peccary, unless it is cut out as soon as the animal is killed.

The collared peccary is the smaller of the two species, usually weighing less than 75 pounds. It ranges from the southwestern United States south to Patagonia. Within this range numerous geographic races have developed, varying from light grizzled gray to nearly black. It formerly occurred within our border north to the Red River of Arkansas, but is now limited to the southern half of Texas and the southern parts of New Mexico and Arizona.

In tropical America collared peccaries are found in dense forests or in low jungles, but in northern Mexico and the southwestern United States they are equally at home among scattered thickets of cactus and other thorny plants on plains and in the foothills. They are strictly gregarious and live in bands of from a few individuals up to thirty or more, usually led by the oldest and most powerful boar. They are omnivorous, feeding on everything edible, from roots, fruits, nuts, and other vegetable products to reptiles and any other available animals. They are specially numerous in many tropical forests where wild figs, nut palms, and other fruit-bearing trees provide abundant food. In the arid northern part of their range dense thickets of cactus and mesquite afford both food and shelter. Their presence in a locality is often indicated by the rooted-up soil where they have been feeding.

Young peccaries become very tame and make most intelligent and amusing pets. One moonlight night on the coast of Guerrero two of us, after a bath in the sea by a small Indian village, strolled along the hard white sand to enjoy the cool breeze. Suddenly a little peccary, not weighing over eight or ten pounds, came running to meet us and, after stopping at our feet to have its head scratched, suddenly circled about us, away and back again in whirling zigzags, with all the joyous frenzy of a playful puppy. Continuing this performance, it accompanied us for several hundred yards, until we returned to the village.

Tales of the ferocity of bands of the collared peccaries and of their treeing hunters who have disturbed them read well to the novice, but have little foundation in fact. In reality the animals are shy and retiring and fight only when forced to do so for self-protection. When brought to bay by dogs or other animals, they fight viciously, and with their sharp, knife-edged tusks can inflict serious wounds. Their natural enemies are mainly the jaguar in the south and bobcats and coyotes, which prey upon their young, in the north.

The increasing occupation of our Southwest has already resulted in the extermination of peccaries from most of their former range within our border, and unless active steps are taken to protect the survivors their days will be few in the land. They are such unique and harmless animals that it is hoped interest in their behalf may be awakened in time to retain them as a part of our wild life.

ROCKY MOUNTAIN SHEEP (Ovis canadensis and its relatives)

Wild sheep inhabit mountain ranges in both Old and New Worlds. Northern Africa and southern Europe have representative species, but Asia appears to be the true home of the group. There the greatest variety of species is found, including such giants as *Ovis poli*.

In the New World they occur only in North America, where there are two or three species, with numerous geographic races. Among these the sheep inhabiting the main Rocky Mountain region is best known. It is a heavier animal than its northern relatives of the Stikine country and Alaska, with larger and more massively proportioned horns. It occupies the main range from south of Peace River and Lake Babine, in British Columbia, to Colorado, and possibly northern New Mexico. Closely related geographic races occur elsewhere in the mountains of the western United States and northern Mexico.

The usual conception of wild sheep as habitants of the cold, clear upper world at timberline and above is justified in the case of the Rocky Mountain sheep. In early spring its one or two young are born amid these rugged elevations, where it remains until the heavy winter snows drive it down, sometimes through the open timber to the foothills. That wild sheep thrive equally well under very different conditions, however, is shown by their abundance on the treeless mountains of our southwestern deserts, among cactuses, yuccas, and other thorny vegetation, where water is extremely scarce and summer temperatures rise high above 100° Fahrenheit in the shade.

The Rocky Mountain sheep, like other species, appears to feed on nearly every plant growing within its domain. In spring many lambs are killed by bald and golden eagles, and in winter, when driven down to lower levels by snow, it becomes easy prey for mountain lions, wolves, and coyotes. Owing to continuous hunting, this sheep has disappeared from many of its former haunts and is decreasing in most of its range. When effective protection is undertaken in time, however, as in Colorado, the range is readily restocked.

The sure-footedness with which a band of these sheep will dash in full flight up or down seemingly impossible slopes, where a misstep

would mean death, is amazing. Even the old rams, with massive sets of horns, bound from point to point up a steep rock slope with marvelous grace and agility. Mountain sheep living among the rugged summits of high ranges possess the courage and prowess of skillful mountaineers, so admired by all, and the mere sight of one of these animals in its native haunts is an adventure achieved by few.

No other big-game animal carries with it the romantic glamour which surrounds this habitant of the cold, clear upper world. Big-game hunters prize above all others their mountain-sheep trophies, which form vivid reminders of glorious days amid the most inspiring surroundings and evidence their supreme prowess in the chase.

STONE MOUNTAIN SHEEP (Ovis stonei)

Owing to its dark, iron gray color, *Ovis stonei* is often called the "black" mountain sheep. Despite its dark color, the Stone sheep is probably a geographic race of the pure white Dall sheep of Alaska. It has the same slender, gracefully coiled horns, frequently amber colored and extended in a widely spread spiral.

Its range lies in northern British Columbia, especially about the upper Stikine River and its tributaries; thence it extends easterly to Laurier Pass in the Rocky Mountains, north of Peace River, and south perhaps to Babine Lake. Unfortunately it appears to have become extinct in the southern border of its range, so that its real relationship with the Rocky Mountain sheep farther south may never be determined.

The sheep occupying the mountains between the home of typical *stonei* and that of *dalli* in northwestern British Columbia and southeastern Yukon Territory are characterized by having white heads, with bodies of a varying shade of iron gray, thus showing evident intergradation on a great scale between the white northern sheep and the "black" sheep of the Stikine. These intermediate animals have been called the Fannin, or saddle-backed, sheep (*Ovis fannini*). Hunters report a considerable mingling of entirely white animals among flocks of these intergrading animals, and occasionally white individuals are seen even in flocks of the typical dark sheep of the Stikine country.

Like the white Alaskan sheep, the Stone sheep exists in great abundance in many parts of its range, especially east of Dease Lake. It usually ranges in flocks, those made up of ewes and young rams often containing a considerable number. The old bucks, except in fall, keep by themselves in smaller bands in separate parts of the range. The Stone sheep lives in one of the most notable big-game fields of the continent. Its home above timberline is shared with the mountain goat and in the lower open slopes with the caribou, while within the adjacent forests wander the moose and two or more species of bear.

Owing to its frequenting remote and sparsely inhabited country, it continues to exist in large numbers; but if its range becomes more accessible, only the most stringent protection can save this splendid animal from the extermination already accomplished on the southern border of its range.

DALL MOUNTAIN SHEEP (Ovis dalli)

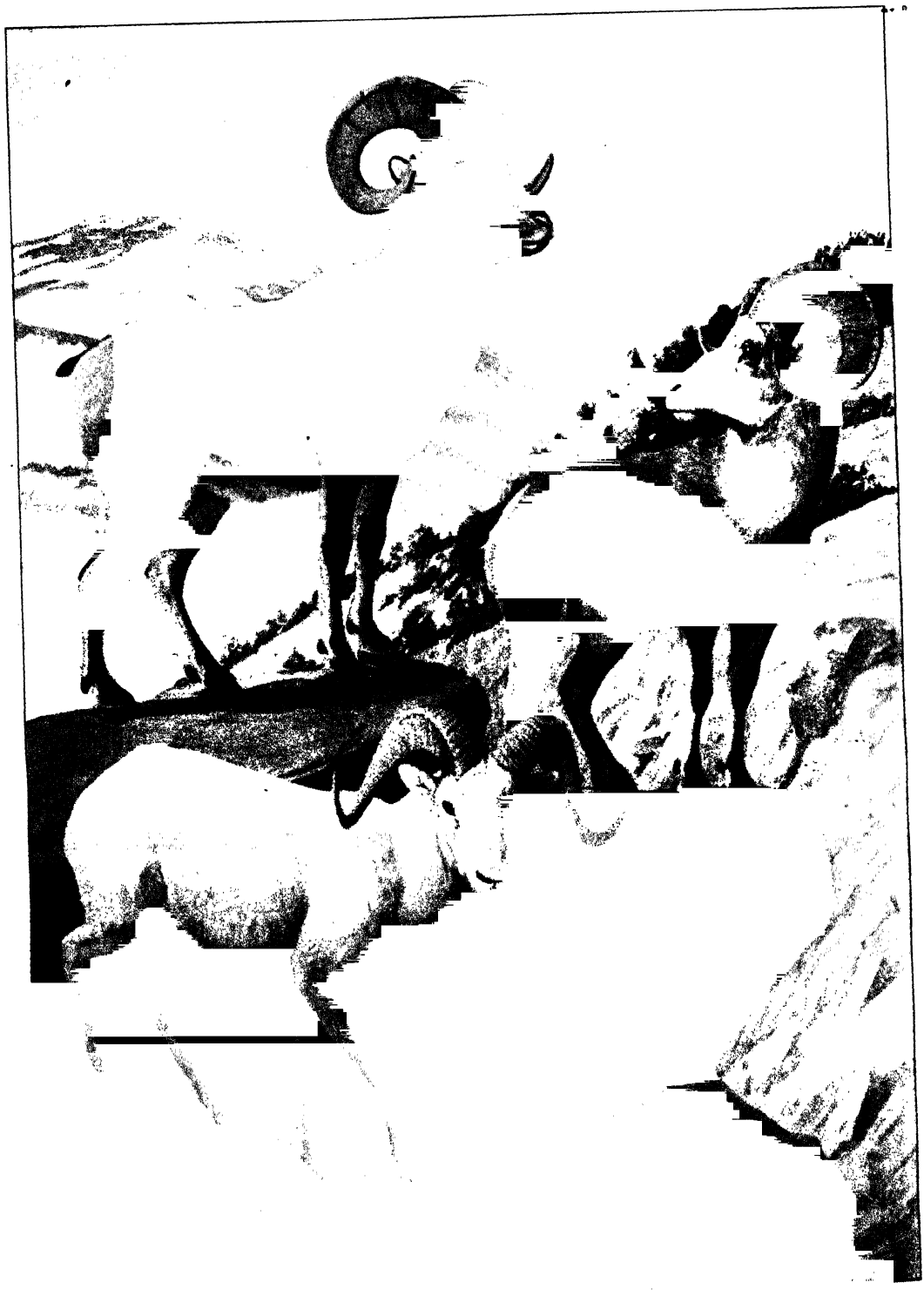
The only variation in the pure white coat of the Dall sheep is a mixture of a few black hairs on the rump, sometimes becoming plentiful enough to form a blackish spot on the tail and a light brownish stain over the entire body, due to the slight discoloration at the tips of the hairs from contact with the earth in their bedding-down places. Their horns are usually dull amber yellow and are notable for their slender proportions and the grace of their sweeping coils, which sometimes curve close to the head and again spread in a wide, open spiral.

As their white coats indicate, the Dall sheep are the northernmost of their kind in America. Their home lies mainly in Alaska, where they were formerly abundant in many mountain ranges, from those bordering the Arctic coast south through the interior to the cliffs on Kenai Peninsula, but are now scarce or gone from some mountains. To the eastward they are numerous across the border in much of Yukon territory, nearly to the Mackenzie River. Their haunts lie amid a wilderness of peaks and ridges, marked in summer with scattered glaciers and banks of perpetual snow and in winter exposed to all the rigors of a severe Arctic climate. They are extraordinarily numerous in some districts, as among the outlying ranges about the base of Mount McKinley.

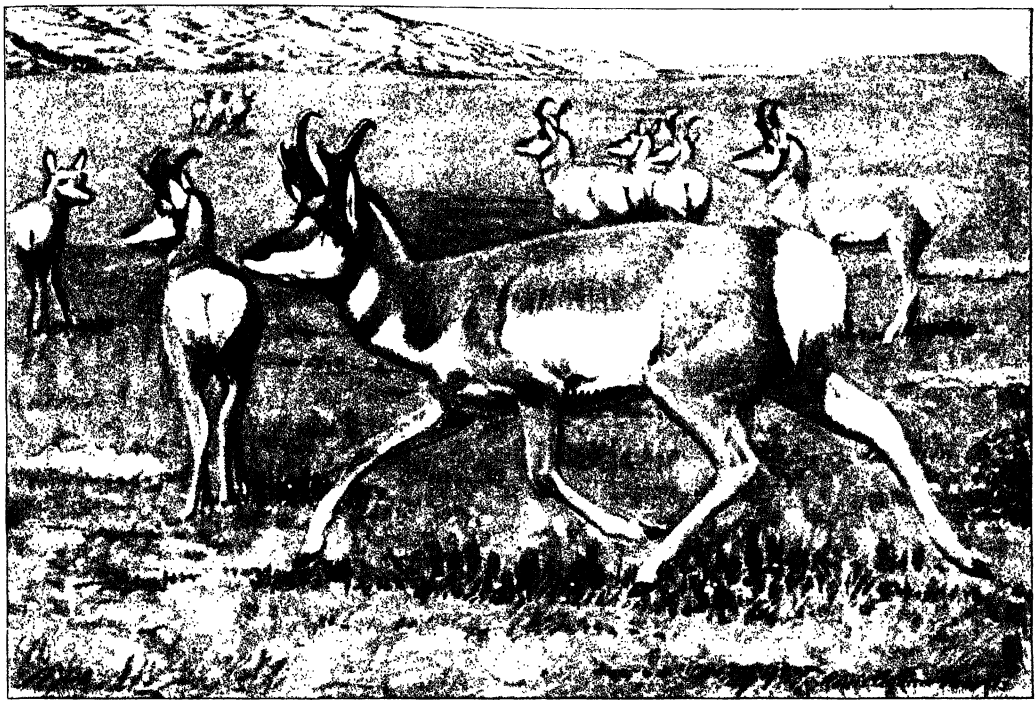
In their high, bleak homes these sheep have little to fear from natural enemies, although the great Canada lynx, the wolf, the wolverine, and the golden eagle, as overlords of the range, take occasional toll from their numbers. Their one devastating enemy is man, with his modern high-power rifle. Even so long ago as the summer of 1881, I saw hundreds of their skins among the Eskimos at Point Barrow, taken that spring with the use of Winchester rifles among the mountains lying inland from the Arctic coast. Of late years the advent of miners and the establishment of mining camps and towns have greatly increased the demand for meat, and this has resulted in the killing of thousands of these sheep. Large numbers of these splendid animals have also been killed to serve as winter dog food.

The advent of thousands of men engaged in the construction of the government railroad which, when completed, will pass through the Mount McKinley region, makes imminent the danger of extermination that threatens the mountain sheep, as well as the moose and caribou, in a great area of the finest big-game country left under our control.

Properly conserved, the game animals of Alaska will continue indefinitely as one of its richest resources, but heedless wastefulness may destroy them forever. All sportsmen and



STONE'S, FANNIN'S, AND DALL'S MOUNTAIN SHEEP



PRONG-HORN ANTELOPE



ROCKY MOUNTAIN GOAT

other lovers of wild life should interest themselves in an effort to safeguard the future of Alaskan game animals before it is too late; for, under the severe climatic conditions prevailing, the restocking of exhausted game fields in that region will be extremely difficult, if not practically impossible.

ROCKY MOUNTAIN GOAT (Oreamnos montanus and its subspecies)

The numerous wild goats of the Himalayas and other mountains of Asia are represented in America solely by the Rocky Mountain goat. This is one of the most characteristic, but least graceful in form and action, of our big-game animals. It is distinguished by a long ungainly head, ornamented with small black horns; a heavy body, humped at the shoulders like a buffalo, and a coat of long shaggy white hair.

The range of these habitants of the cliffs extends from the head of Cook Inlet, Alaska, easterly and southerly through the mountains to Montana and Washington. Unlike mountain sheep, the goats do not appear to dislike the fogs and saline winds from the sea, and at various points along the coast of British Columbia and Alaska they range down precipitous slopes nearly to the shore.

They are much more closely confined to rugged slopes and rocky ledges than the mountain sheep, which in winter commonly descend through the foothills to the border of the plains. Through summer and winter, goats find sufficient food in the scanty vegetation growing among the rocks, and their heavy coats of hair protect them from the fiercest winter storms.

Owing to their small horns and unpalatable flesh they are less sought after by hunters than mountain sheep, and thus continue to exist in many accessible places where otherwise they would long since have become exterminated. They are frequently visible on the high ledges of a mountain across the bay from the city of Vancouver and are not difficult to find in many other coastal localities.

Although marvelously surefooted and fearless in traversing the faces of high precipitous slopes, goats lack the springy grace and vivacity of mountain sheep and move with comparative deliberation. They are reputed to show at times a stupid obstinacy when encountered on a narrow ledge, even to the point of disputing the right of way with the hunter.

Their presence lends interest to many otherwise grim and forbidding ranges where, amid a wilderness of glacier-carved escarpments, they endure the winter gales which for days at a time roar about their cliffs and send snow banners streaming from the jagged summits overhead.

Owing to the character of their haunts, mountain goats have few natural enemies. The golden and bald eagles now and then take toll among their kids, but the lynx and mountain lion, their four-footed foes, are not known to prey upon them to any considerable extent. Through overhunting they have vanished from some of their former haunts, but still hold their own in many places, and with effective protection will long continue to occupy their peculiar place in our fauna.

PRONG-HORN ANTELOPE (Antilocapra americana and its geographic races)

Unique among the antelope of the world, among which it has no near relatives, the prong-horn, because of its beauty of coloration, its grace, and fleetness, claims the attention of sportsmen and nature lovers alike. It is a smaller and slenderer animal than the larger forms of the Virginia deer. Its hair is coarse and brittle, and the spongy skin lacks the tough fiber needed to make good buckskin. Both sexes have horns, those of the doe being smaller and slenderer. One of the extraordinary peculiarities of this antelope is its habit of shedding the horns every fall and the developing new horns over the remaining bony core.

The rump patch of the prong-horn is formed of long pure white hairs, which in moments of excitement or alarm are raised on end to form two great chrysanthemum-like white rosettes that produce an astonishingly conspicuous directive color mark. The power to raise these hairs is exercised by the fawns when only a few days old. Even when the hairs are not erected the rump patch is conspicuous as a flashing white signal to a distance of from one to two miles as the antelope gallops away. When the animal whose rump signal has been plainly visible at a distance suddenly halts and faces about to look back, as is a common custom, its general color blends with that of the background and it vanishes from sight as by magic.

Early explorers discovered antelope in great abundance over a vast territory extending from near the present location of Edmonton, Alberta, south to near the Valley of Mexico, and from central Iowa west to the Pacific coast in California. They were specially numerous on the limitless plains of the "Great American Desert," where our pioneers found them in great bands, containing thousands, among the vast herds of buffalo. So abundant were they that it has been estimated that on the Great Plains they equaled the buffalo in numbers. Now reduced to a pitiful remnant of their former numbers, they exist only in widely scattered areas, where they are constantly decreasing. Fortunately they are strictly protected by law in most of their remaining territory.

The great herds containing thousands of antelope were usually formed late in fall and remained together throughout the winter, separating into numerous smaller parties during the summer. For years following the completion of the transcontinental railroads they were commonly seen from the car windows as trains crossed the Great Plains. At such times their bright colors and graceful evolutions, as they swept here and there in erratic flight or

wheeled in curiosity to gaze at the passing train, never failed to excite the deepest interest.

In early days prong-horns were noted for their curiosity and were frequently lured within gun-shot by waving a red flag or by other devices. I have repeatedly seen them circle or race a team, or a horseman, crossing their range. In racing a horseman traveling along an open road or trail they gradually draw nearer until finally every member of the band dashes madly by only a few yards in front and then straight away across the plains in full flight.

The prong-horns appear to possess a highly nervous temperament, which requires for their welfare the wide free sweep of the open plains. They do not thrive and increase in inclosures, even in large game preserves, as do deer, elk, and buffalo. For this reason, it will require the greatest care to protect and foster these attractive members of our fauna to save them from soon being numbered among the many wild species which have been destroyed by the coming of civilized man.

WAPITI, OR AMERICAN ELK (Cervus canadensis and its relatives)

By a curious transposition of names the early settlers applied to the American wapiti the term elk, which belongs to the European representative of our moose. Our elk is a close relative of the European stag. It is the handsomest and, next to the moose, the largest member of the deer family in America. The old bulls, weighing more than 800 pounds, bear superb widely branched antlers, which give them a picturesque and noble mien. This is the only American deer which has a well-marked light rump-patch. The young, numbering from one to three, are white spotted, like the fawns of other deer.

Originally the elk was the most wide ranging of our hoofed game animals. It occupied all the continent from north of Peace River, Canada, south to southern New Mexico, and from central Massachusetts and North Carolina to the Pacific coast of California. Like the buffalo, it appeared to be equally at home in the forested region east of the Mississippi River and on the open plains flanking the Rocky Mountains. Its range also extended from sea-level to above timberline on lofty mountain ranges.

Exterminated throughout most of their original range, elk still occupy some of their early haunts in western Canada, Montana, Wyoming, Colorado, and the Pacific Coast States. The last elk was killed in Pennsylvania about 60 years ago, and in Michigan and Minnesota some 20 years later. The main body of the survivors are now in the Yellowstone Park region. Their size and the readiness with which they thrive in captivity has led to serious consideration of elk farming as an industry.

In the West, before the settlement of their range crowded the elk back, large numbers lived throughout the year on the plains and among the foothills. They have now become mountain animals, spending the spring and summer largely in the timberline forests and alpine meadows, where many bands linger until the heavy snows of early winter force them down to the foothills and valleys. During the last days of their abundance in the Rocky Mountains winter herds numbering thousands gathered in Estes Park and other foothill valleys.

Elk are the most polygamous of all our deer, each bull gathering a small herd of cows during the fall. At the beginning of the mating season the bulls wander widely through the high forest glades, their musical bugling piercing the silence with some of the most stirring notes of the wilderness. Amid the wild grandeur of these remote mountain fastnesses the appearance of a full-antlered buck on the skyline of some bare ridge presents a noble picture of wild life.

There are probably over 40,000 elk still left in the United States, and of these more than 30,000 are located in Wyoming, mainly in and about Yellowstone National Park.

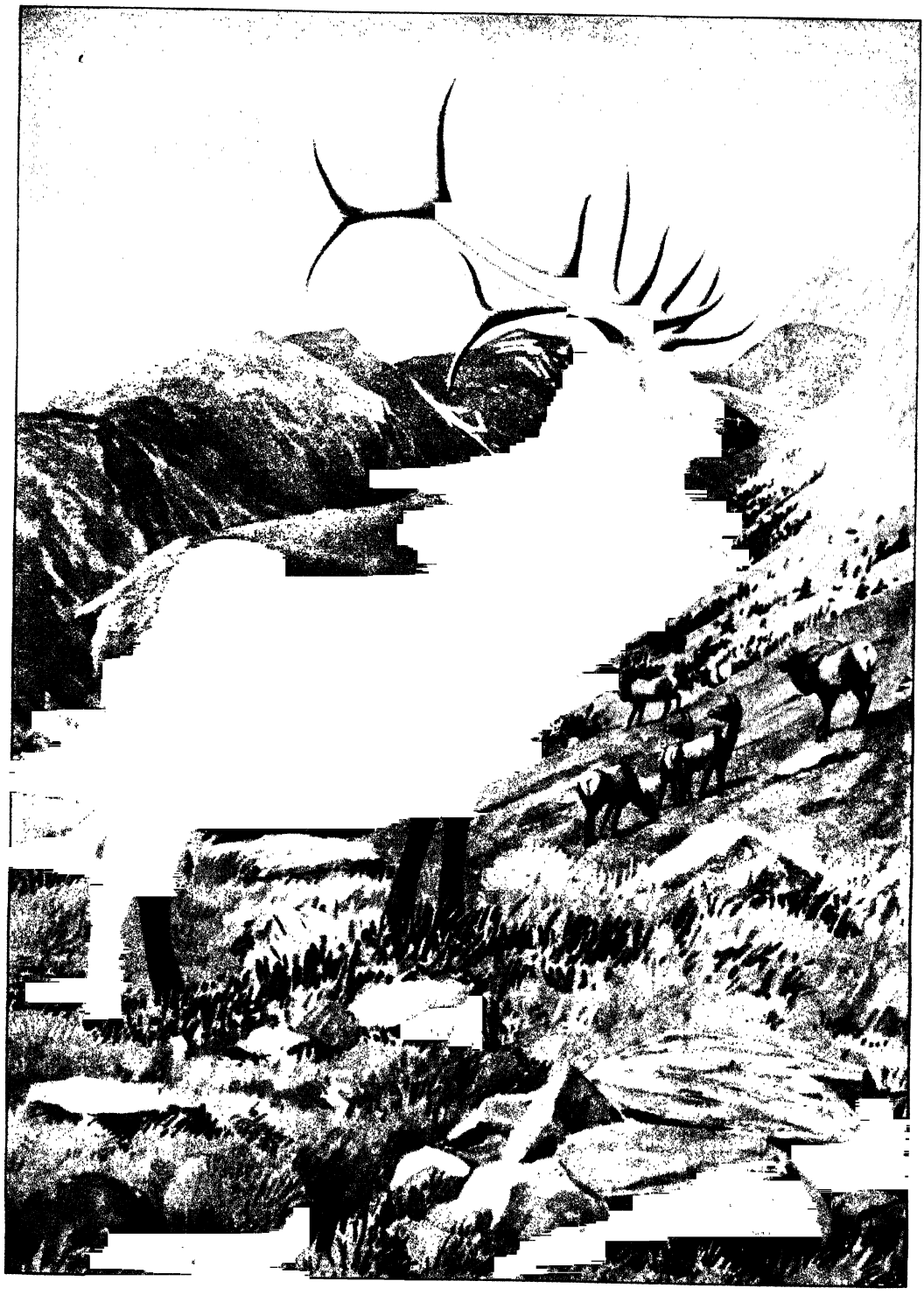
During the last few years great interest has been shown in the reintroduction of elk in parts of their former range, where they had been exterminated and where conditions are still suitable for their perpetuation. Such efforts are meeting with much success. Not only do the animals thrive and increase rapidly, but local sentiment is almost unanimous in their favor. This is well shown by the active interest taken by both cattle and sheep owners in northern Arizona in regard to a band of elk introduced a few years ago on their mountain stock ranges. The stockmen exercise a virtual wardenship over these animals that insures them against molestation, and the herd is rapidly increasing.

As against this, we have the despicable work of poachers, who are shooting elk for their two canine teeth and leaving the body to the coyotes. Information has been received that more than 500 elk were ruthlessly slaughtered for this purpose about the border of Yellowstone National Park during the winter of 1915-1916.

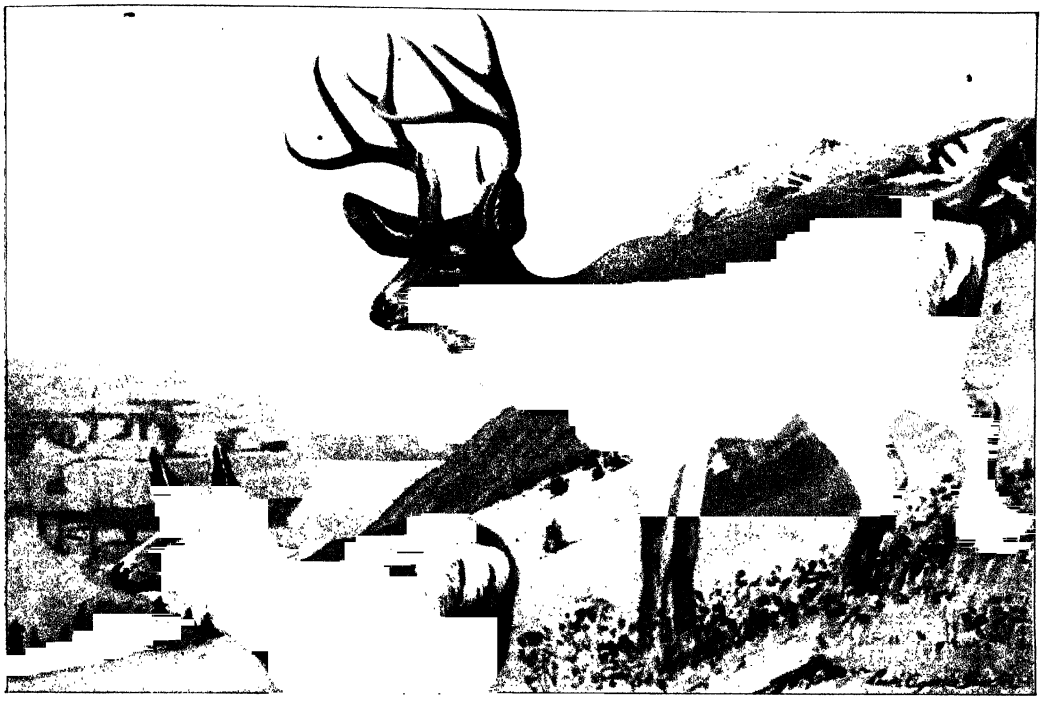
MULE DEER (Odocoileus hemionus and its subspecies)

Mule deer are larger than the common white-tails, with a heavier, stockier form. Their strongest characteristics lie in the large doubly branching antlers, large broad ears, and rounded whitish tail with a brushlike black tip. Their common name in this country and the name "venado burro" in Mexico are derived from the great, donkeylike ears. Their antlers vary much in size, but in some examples are almost intermediate between those of the white-tail and of the elk. Antlers of the mule deer and of the black-tail agree in having the tines all pronged, in contrast with the single spikes of the white-tails. In summer these deer have a rich, rusty red coat which is exchanged in winter for one of grayish brown.

The range of mule deer extends from northern Alberta, Manitoba, and western Iowa to the State of San Luis Potosi, on the Mexican



WAPITI, OR AMERICAN ELK



MULE DEER



BLACK-TAILED DEER

table-land, and west to Lower California and the coast of California. Within these limits they inhabit different types of country, from the deciduous forests along streams on the eastern border of the Great Plains to the open pine forests of the high western mountains, the chaparral-covered hillsides of southern California, and the thickets of mesquites, acacias, and cactuses on the hot and arid plains of Sonora. Several geographic races of this deer have resulted from these varied conditions.

In spring in the Rocky Mountains the does leave the bands with which they have passed the winter and seek undisturbed retreats among forest glades or along scantily wooded slopes of canyons, where they have two or three handsomely spotted fawns with which they remain apart throughout the summer.

The bucks usually keep by themselves during the summer, in parties rarely exceeding ten. As their horns lose the velvet and the mating season draws near, the old bucks gather in bands of from six to ten.

At this time they are in perfect physical condition, and a band of them in the open forest, their antlers held proudly aloft and their glossy coats shining in the sun, presents a superb picture. They have little of the protective caution so characteristic of the white-tails, and when a shot is fired at a band they often begin a series of extraordinary 'buck jumps," bounding high in the air, facing this way and that, sometimes not taking flight until after several additional shots have been fired. These high, bounding leaps are characteristic of mule deer and are commonly made when the animals are suddenly alarmed and often when they are in full flight through brushy thickets.

After the mating season, bucks and does join in bands, sometimes of fifteen or twenty, and descend to the foothills and sometimes even to the adjacent plains. Their preference, however, is for rough and broken country, such as that of canyon-cut mountains or the deeply scored badlands of the upper Missouri River.

These deer are not good runners in the open. On several occasions, on level country in Arizona, I have ridden after and readily overtaken parties of them within a mile, their heaving flanks and open mouths showing their distress. The moment rough country was reached, however, with amazing celerity a series of mighty leaps carried them away from me over declivities impossible for a horse.

The sight of a party of these splendid deer bounding away through the aisles of a mountain forest always quickens one's pulse and gives the finishing touch of wildness to the scene. Mule deer are characteristic animals of the beautiful open forests and forest-parks of the Rocky Mountains and the high Sierras, where they may be perpetuated if given reasonable protection.

BLACK-TAILED DEER (Odocoileus columbianus and its subspecies)

In general appearance the black-tails have a close resemblance to the mule deer, but average smaller. They have the same large ears, forked tines to the antlers, and rather "stocky" body; but the brushy all-black tail distinguishes them from any other American deer. In color they have much the same shade of brown as the Virginia deer. They have the usual cycle of annual changes common to most American deer—assuming a dull coat in fall and losing their horns in winter, followed by the resumption of a brighter coat in spring and the renewal of their horns in summer.

The black-tails have one of the most restricted ranges among our deer. They are limited to the humid heavily forested belt along the Pacific coast from Juneau, Alaska, southward to the Coast range in central California. This coastal belt is characterized by superb growths of cedars, spruces, and firs in the north and by redwoods and firs in the south, uniting to make one of the most magnificent forest areas in the world. Here the deer live in the midst of rank undergrowths of gigantic ferns and other vegetation, as luxuriant in many places as that of the humid tropics.

Their home on the abruptly rising slopes of the islands in the Alaskan Archipelago is so restricted that both in summer and winter they fall an easy prey to native and white hunters. It has been reported that there has been much wasteful killing of the deer on these islands for commercial purposes. When the heavy snows of winter on the islands force the deer down to the shore, great numbers of them are also killed by wolves.

Black-tails commonly have two or three young, and this fecundity, combined with the effective protection given by the dense forest where many of them live, will aid in their perpetuation. At the same time they have not developed the mental alertness of the Virginia deer, and there is imminent need for prompt and effective action in safeguarding the deer in the Alaskan part of their range if their extermination on some of the islands is to be prevented. In this northern region the black-tails share their range with strange tribes of coastal Indians, whose huge sea-going canoes, totem poles, and artistic carvings are unique among native Americans.

VIRGINIA, OR WHITE-TAILED, DEER (Odocoileus virginianus and its subspecies)

The aptness of the name "white-tail" for the Virginia deer is obvious to any one who has startled one in the forest and seen it dash away with the tail upright and flashing vivid white signals at every leap. The adults have two strongly contrasted coats each year: brownish gray in winter and rusty red in summer. The fawns, usually two in number, are dull rusty brown, marked with a series of large white spots, which remain until the gray winter coat is assumed in the fall. Large bucks sometimes attain a weight of more than 300 pounds.

The white-tail is the well-known deer of all the forest areas in eastern North America. With its close relatives, it ranges from north-

ern Ontario to Florida and from the Atlantic coast to the Great Plains; also in the Rocky Mountains south to New Mexico, and in the Cascades and Sierra Nevada to northern California.

The supreme importance of this deer to the early settlers of the Eastern States is made plain in all the literature covering the occupation of that region. Its flesh was one of the most reliable staples in the food supply, and not infrequently was the only resource against starvation. In addition, the tanned skins served for clothing and the sinews for thread. Many of the most striking and romantic characters in our early history appear clad in buckskin, from fringed hunting shirt to beaded moccasins.

As no other American game animal equaled the white-tail in economic value to the settlers, so even to-day it remains the greatest game asset in many of the Eastern States. Partly through protective laws and partly through its acute intelligence and adaptability, the Virginia deer continues to hold its own in suitable woodland areas throughout most of its former range, and in recent years has pushed hundreds of miles northward into new territory in Ontario and Quebec.

Even in the oldest and most densely populated States, as New York and Massachusetts, white-tails still exist in surprising numbers. Over 7,000 were killed during the hunting season of 1915 in Maine, and an average of about 2,800 are killed yearly in Vermont. The great recreational value of the white-tail to a host of sportsmen is obvious. To the growing multitude of nature lovers the knowledge that a forest is inhabited by deer immediately endows it with a delightful and mysterious charm.

In summer white-tails are usually solitary or wander through the forest in parties of two or three. In winter, where the snowfall is heavy, they gather in parties, sometimes of considerable size, in dense deciduous growth, where food is plentiful. There they remain throughout the season, forming a "yard" by keeping a network of hard-beaten paths open through the snow in order to reach the browse afforded by the bushes and trees.

Ordinarily Virginia deer are shy and elusive habitants of dense forests, where they evade the unpracticed intruder like noiseless shadows. Where they are strictly protected for a period of years under State laws, they become surprisingly confident and often damage young orchards and crops on farms near their haunts. Several States pay for the damage thus done. Happily this attractive species thrives so well under protective laws that its continued future in our forests appears to be assured.

ARIZONA WHITE-TAILED DEER
(Odocoileus couesi)

The Arizona white-tails are slight and graceful animals, like pigmy Virginia deer, so small that hunters often ride into camp with a full-grown buck tied back of the saddle. They have two seasonal pelages—gray in winter and more rusty brown in summer. The antlers, very small, but in form similar to those of the Virginia deer, are shed in winter and renewed before the end of summer.

These handsome little deer, the smallest of our white-tails, are common in many of the wooded mountains of middle and southern Arizona, southern New Mexico, western Texas, and in the Sierra Madre of Chihuahua and Sonora, Mexico. By a curious coincidence this area was the ancient home of the Apache Indians and has had one of the most tragic histories of our western frontier.

During summer and early fall in the higher ranges small bands of Arizona white-tails occupy the lower parts of the yellow-pine forests, between 6,000 and 9,000 feet altitude, where they frequent thickets of small deciduous growth about the heads of canyons and gulches. As winter approaches and heavy snowstorms begin, they descend to warm canyon slopes to pass the season among an abundant growth of pinyons, junipers, oaks, and a variety of brushwood.

In the White Mountains of Arizona, between the years 1883 and 1890, when wild life was more abundant than at present, I often saw, on their wintering grounds, large herds of these graceful deer, numbering from 20 to more than 100 individuals. Such gatherings presented the most interesting and exciting sight, whether the animals were feeding in unconscious security or streaming in full flight along the numberless little trails that lined the steep slopes. Where these deer live on the more barren and brush-grown tops of some of the desert mountains in southwestern Arizona and Sonora, the snowfall is so light that their summer and winter range is practically the same.

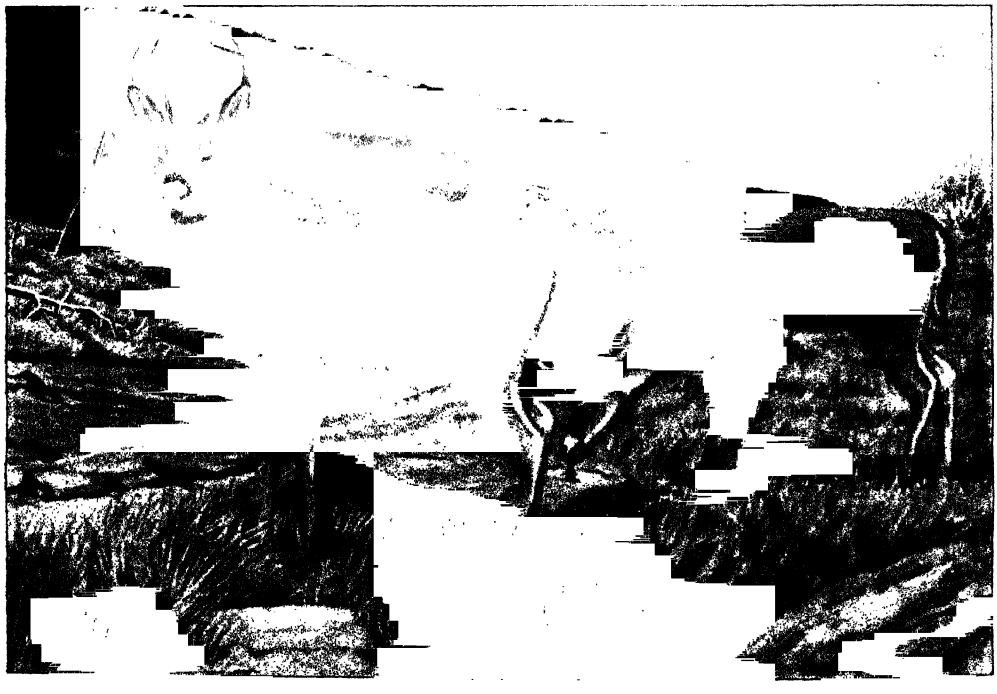
Although far more gregarious than our other white-tails, the herds of Arizona deer break up in early spring. At this time one or two fawns are born, amid early flowers in the charming vistas of the open forest. Very young fawns are hidden in rank vegetation and sometimes left temporarily by their mothers. If a horseman chances by the fawns may rise and follow innocently at the horse's heels. On such occasions I have had difficulty in driving them back to prevent their becoming lost.

In the Sierra Madre of Chihuahua one summer I found these little white-tails occupying "forms," like rabbits, located in the sheltering matted tops of fallen pine trees which had been overthrown by spring storms. In these shelters they rested during the middle of the day, secure from the wolves and mountain lions which prowled about the canyon slopes in search of prey.

With the growing occupation of their territory by cattle and sheep and the increase in the number of hunters, these once abundant deer are rapidly diminishing. It is high time more careful measures be taken for their conservation, else extermination awaits them throughout most of their original haunts.



VIRGINIA, OR WHITE-TAILED, DEER



ARIZONA WHITE-TAILED DEER



WOODLAND CARIBOU

WOODLAND CARIBOU (Rangifer caribou and its subspecies)

The caribou lacks the symmetry and grace of the true deer. Its large head topped with irregular antlers, heavy body, and thick, sturdy legs, ending in large, broad-spreading hoofs, produce a distinctly ungainly animal. It is the only member of the deer family in which both sexes have antlers, those of the female being smaller and slenderer than those of the male. It varies in size in different parts of its range, but large old bulls usually weigh from 300 to 400 pounds. A single calf is the rule, but occasionally there are two.

The woodland caribou, the southern representative of the barren ground caribou, inhabits almost the same northern forest of spruce, tamarack, birch, and alder as those sheltering the moose. It ranges from the northern border of the forests in Alaska and Canada south to Maine, northern Minnesota, northern Idaho, and British Columbia. It is far less gregarious than the barren ground caribou, during summer only small parties of cows, calves, and partly grown young keeping together, while the bulls are solitary or in still smaller separate parties. In winter all unite in larger herds.

The curiously ungraceful appearance of the caribou, so different from other deer, gives it a strong individuality, which seems to belong with its remote haunts in the wilderness. This great animal has an added appeal to our interest, owing to its close relationship to that other woodland caribou which was such an important resource to the cave-men of France and other parts of Europe, as shown by bone and horn implements, carvings, and other records discovered in their homes.

During summer and fall in eastern Canada, where this caribou is distributed through much of the wilder forests, it has a habit of coming out of the woods to sun itself and bathe on the borders of shallow lakes. Here the old bulls wallow in the water, and on rising shake themselves like a dog, filling the air with a halo of sparkling water drops. In such places the bulls frequently stand basking in the sun for hours. To a canoeman gliding silently around a jutting point, this rugged habitant of the wilds, discovered across the shining waters, standing outlined against the dark green forest, represents a wonderfully picturesque sight. When alarmed at such times the caribou dashes shoreward through the water amid clouds of flying spray struck up by its broad feet and vanishes in the sheltering forest, accompanied by a loud crashing of dry branches.

The woodland caribou is neither so swift nor so astute in avoiding danger as the Virginia deer or the moose. It falls an easy prey to hunters and to wolves, and when not properly safeguarded is readily exterminated. This is shown by its complete disappearance from the Adirondacks, in northern New York, and by its threatened disappearance from the forests of Maine, Minnesota, and Idaho; in fact, the woodland caribou is in more imminent danger of complete and early extermination within the United States than any other game animal and can be saved only by stringent laws and careful guardianship.

BARREN GROUND CARIBOU (Rangifer arcticus and its subspecies) (see illustration, page 421)

The typical barren ground caribou is smaller and paler colored than the woodland species. Several geographic races have been distinguished, among which the most notable is the Peary caribou, the palest of all and the subject of the accompanying drawing. Like other members of the group, this species is a heavily built animal, with thick legs and large feet.

The barren ground caribou is characteristic of the desolate Arctic barrens and tundras beyond the limit of trees, ranging to the northernmost limit of land beyond 83 degrees of latitude. When explorers first visited these northern wilds, including the treeless coastal belt from the Peninsula of Alaska to Bering Straits, they found these animals almost everywhere in extraordinary abundance. Over great areas of this territory straggling herds of caribou, sometimes numbering hundreds of thousands, drifted with the season from one feeding ground to another.

The advent of white men with guns has resulted in their rapid decrease everywhere and in their extermination over great areas. In many of their old haunts the only trace of their former abundance is in well-marked trails winding by easy grades to the bare tops of the low mountains. They are still numerous on the Peninsula of Alaska and in much greater numbers in parts of the barren grounds of Canada. There, on the shores of Artillery Lake, during the summer of 1907 a small migrating herd of about 2,000 was seen.

When alarmed these caribou often break into a clumsy gallop, which soon changes to a steady shambling trot, their characteristic gait, carrying them rapidly across country. In winter their tracks in the snow show that their feet, instead of being raised high at each step, like those of a Virginia or mule deer, drag through the snow like those of domestic cattle. Their large, broad-spreading hoofs, with sharp, cup-shaped edges, are admirably adapted to secure a firm footing in the yielding and hummocky surface of their haunts in summer and on the snow and ice in winter.

The barren ground caribou, living under severe climatic conditions, has developed an extraordinary method of storing up fat to carry it through winter stresses. Early in fall a layer of pure tallow, called "backfat," is formed over the entire top of the back from between the shoulders to the rump. This is a solid slab of tallow lying between the superficial muscles and the skin. It is almost as thin as a knife-blade at the shoulders, but thickens gradually to a depth of from 4 to 6 inches at the rump. This slab of tallow is gradually absorbed during the winter and has totally disappeared by spring. In early winter the "backfat" is easily

removed and transported in its original form. It is highly prized for food and as an article of trade among the Eskimo and Indian hunters, and figures as one of the chief delicacies at their winter feasts.

The Peary caribou lives in Ellesmere, Grinnell, and other of the northernmost Arctic lands to beyond 83 degrees of north latitude, where in places it is common. It appears to thrive on moss, lichens, and other dwarf and scanty Arctic vegetation, and holds its own against the depredations of packs of the white Arctic wolves. In these northern wilds, amid the most intense cold, the caribou passes from three to five months of continuous night, its wanderings lighted only by the moon, stars, and the marvelous displays of waving northern lights.

Tame reindeer, which are kept by the people of the Arctic border of the Old World from Lapland to Bering Straits, are domesticated descendants of the barren ground caribou of that region. They are used by their owners to pack burdens and haul sledges as well as to supply them with food and clothing. These animals have been successfully introduced in Alaska, and both natives and white men are developing this new and promising stock industry. The herds of tame reindeer are extremely gentle and easily handled. Their progenitors were like other wild caribou—of a dull and nearly uniform color—but domestication has resulted, as with cattle, in producing endless color variations, from white to black, with every imaginable piebald variation.

The changed conditions of life in Alaska, due to the recent development of that territory, have seriously affected the welfare of the natives. Fortunately the introduction of reindeer herds appears to open a promising future for both Eskimos and Indians.

MOOSE (Alces americanus and its subspecies)

The American moose is a large cousin of the elk of the northern forests of Europe and Siberia. The Old World animal is characterized not only by its smaller size, but also by smaller antlers. The moose is a large, grotesquely formed animal, with the most impressive individuality of any of our large game. Its great head, with oddly formed nose, huge palmated antlers, pendulous bell under the neck, short body, and disproportionately long legs unite to lend the impression that it may be a strange survivor from some remote geologic period.

The moose inhabits our northern forests, where it wanders among thickets of spruce, tamarack, birch, aspen, and alder, from the mouth of the Yukon and the lower Mackenzie southward to Maine, northern Minnesota, and down the Rocky Mountains to Wyoming. It varies in size in different parts of its range. The bulls of the Kenai Peninsula and adjacent region in Alaska are the largest of their kind in the world, sometimes weighing more than 1,400 pounds. The enormous antlers of these great northern beasts attain a spread of more than six feet and make the most impressive trophy the big-game hunter can secure in America.

Although taller than an ordinary horse, weighing more than half a ton, and adorned with wide-spreading antlers, the bull moose stalks with ghostly silence through thickset forests, where man can scarcely move without being betrayed by the loud crackling of dry twigs. In summer it loves low-lying, swampy forests interspersed with shallow lakes and sluggish streams. In such places it often wades up to its neck in a lake to feed on succulent water plants, and when reaching to the bottom becomes entirely submerged. These visits to the water are sometimes by day, but usually by night, especially during the season when the calves are young and the horns of the bulls are but partly grown.

Late in the fall, with full-grown antlers, the bulls wander through the forest looking for their mates, at times uttering far-reaching calls of defiance to all rivals, and occasionally clashing their horns against the saplings in exuberance of masterful vigor. Other bulls at times accept the challenge and hasten to meet the rival for a battle royal. At this season the call of the cow moose also brings the nearest bulls quickly to her side. Hunters take advantage of this, and by imitating the call through a birch-bark trumpet bring the most aggressive bulls to their doom.

Ordinarily moose are extremely shy, but during the mating season the males become so bold that when encountered at close range they have been known furiously to charge a hunter. They strike vicious blows with their front feet, as well as with their heavy antlers, and make dangerous foes for man or beast.

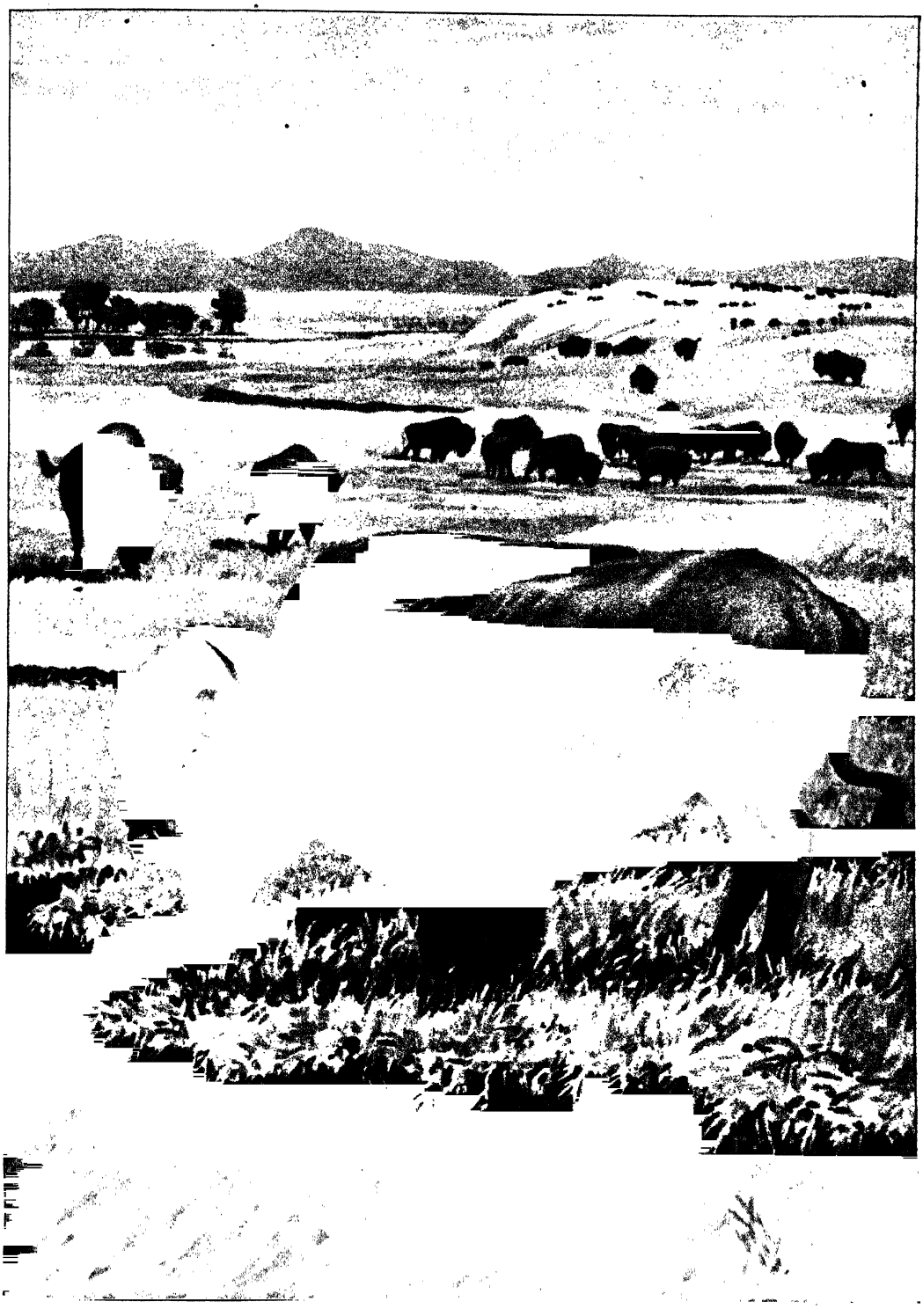
Moose have disappeared from the Adirondacks and have become scarce in many districts where once plentiful. Through wise protection they are still numerous about the head of Yellowstone Lake, and are still among the available game animals of Maine and the eastern provinces of Canada. Indeed, during the last few years they have steadily extended their range in northern Ontario and British Columbia. They occupy great areas of little-visited wilderness, which are becoming more and more accessible; as a result the future existence of these superb animals depends upon their receiving proper protection.

AMERICAN BISON (Bison bison and its subspecies)

The American bison, or buffalo, is a close relative of the larger bison which once inhabited Europe and survives in limited numbers in certain game preserves of Poland and the Caucasus. The size, dark shaggy coat, great head, and high arched shoulders of our bison give them a unique individuality among American big game. They once roamed in vast numbers over a broad territory, extending from Great Slave Lake, Canada, south to southern New Mexico, and from Pennsylvania and eastern Georgia to Arizona and northern Nevada. It



MOOSE



AMERICAN BISON, OR BUFFALO

is thus evident that they were at home in the forested country east of the Mississippi River, as well as on the treeless plains of the West. In the northern part of their range they are larger and darker than elsewhere and form a local geographic race called the wood buffalo.

Originally buffalo were enormously abundant in America, and it has been variously estimated that when the continent was first discovered their numbers were from 30,000,000 to 60,000,000. With the settlement of eastern America, they gradually retreated across the Mississippi River, but continued to exist in great but rapidly diminishing numbers on the Great Plains up to within the last fifty years.

The crossing of their range by the first transcontinental railroad quickly brought the remaining herds to an end. In 1870 there were still about 5,500,000 head on the plains, but these were so wastefully slaughtered for their hides that in 1895 only about 800 remained. The depletion of the herds was so startling that sportsmen and nature lovers awoke to the danger of the immediate extermination of these splendid animals; the American Bison Society was organized and the surviving buffalo were saved.

Although the bison usually has but a single calf a year, these are so hardy and do so well in fenced preserves, and even in the closer confinement of small parks, that their number has now increased to approximately 4,000, about equally divided between the United States and Canada. In the district south of Artillery Lake, northern Canada, a few hundred individuals, remnants of the wild stock of that region, survive and are increasing under the wise protection of the Canadian Government. The only other herd still existing on its original ground is that in Yellowstone National Park.

Experiments have been made in crossing buffalo with certain breeds of domestic cattle for the purpose of establishing a new and hardier variety of stock for the Western ranges. These have not proved successful, largely owing to the lack of fertility in the hybrid, which has been called the "cattalo."

Under primitive conditions, buffalo herds numbering millions of animals regularly migrated in spring and fall from one feeding ground to another, often traveling hundreds of miles for this purpose. The herds followed the same routes year after year and made lasting trails, often from two to three feet in depth. Investigation has shown that many of our highways, and even some of our main railway lines, seeking the most convenient grades, follow trails laid down by these early pathfinders. When a great migrating herd was stampeded, the thunder of its countless hoofs shook the earth, and in its flight it rushed like a huge black torrent over the landscape.

The buffalo was the most important game animal to the Indians over a great area. Several tribes were mainly dependent upon these animals for food and clothing and the entire tribal economy was built about them. The mode of life, customs, and folk-lore of the Indians all centered about these animals. Their clothing and tepee covers were made of the skins. The tanned skins also served as individual and tribal records of the warrior-hunters, the chronicles being drawn in picture-writing on the smooth surfaces. The passing of the buffalo on the free sweep of the western plains ended forever one of the most picturesque phases of aboriginal life in America.

MUSK-OX (*Ovibos moschatus* and its subspecies)

The musk-ox is one of the unique and most interesting of American game animals. In general appearance it suggests a small, odd kind of buffalo, and is, in fact, related to both cattle and sheep. It is a heavily built, round-bodied animal, with short, strong legs and long fringelike hair which hangs so low on the sides that it sometimes trails on the snow. The horns—broad, flat, and massive at the base—curve down and out to a sharp point on each side of the head and form very effective weapons for defense.

Fossil remains prove that musk-oxen lived in northern Europe and Asia during Pleistocene times, but they have long been confined to Arctic America. Up to within a century they have occupied nearly all of the cheerless wilds north of the limit of trees, from the coast of northern Alaska to that of east Greenland. They appear to have become extinct in northern Alaska within the last 75 years, and their present range east of the Mackenzie River is becoming more and more restricted.

They are now limited to that part of the barren grounds of Canada lying north and northwest of Hudson Bay and from the Arctic islands northward and eastward to the northern coast of Greenland. Their range extends to beyond 83 degrees of latitude and covers some of the bleakest and most inhospitable lands of the globe. There a short summer, with weeks of continuous sunshine, permits the growth of a dwarfed and scanty Arctic vegetation; but winter brings a long period of night, continuous, in the northernmost parts, through several months.

Under such rigorous conditions musk-oxen thrive unless hunted by civilized man. They are strongly gregarious, usually traveling in herds of from six to twenty, but herds containing about 100 have been recorded. Their eyesight is not strong, but their sense of smell is good, and when danger is suspected they dash away with great celerity for such heavily formed animals. If rocky ground is near, they seek refuge in it and ascend steep, broken slopes with astonishing agility.

When brought to bay, the herd forms a circle about the calves and, with heads out, presents to the enemy an unbroken front of sharp horns. So long as the circle remains unbroken such a defense is extremely effective against both dogs and wolves. The only natural enemies of musk-oxen are wolves, and against these and the primitive weapons of the Eskimos they hold their own very well.

When the Greely Expedition landed at Lady Franklin Bay in 1881, musk-oxen were encoun-

tered and killed practically on the site where winter quarters were established. Since then several exploring and hunting parties have taken heavy toll from the herds of that region. Some accounts of the wholesale killings do not make pleasant reading for one who desires the perpetuation of our native species. Fortunately for the musk-oxen, the adventurers of these northern quests are few and far between, so that on departing they leave the game animals in their vast solitudes to recuperate from these onslaughts.

Musk-oxen have but a single young, so that between depredations of wolves and overkilling by white and native hunters these animals face the very real danger of extermination threatening so many other game animals in the far North. For this reason, it is hoped that sportsmen who visit these remote game fields will restrain a desire for making large bags.

FLORIDA MANATI (Trichechus latirostris)

The manatis, or manatees, are strange aquatic mammals, with seal-like heads and whalelike bodies. Compared with whales, their flippers are more flexible at the joints, and thus can be used much more freely. They have very small eyes and a heavy upper lip, deeply cleft in the middle and forming a thick lobe on each side. The skin is hairless and covered with fine wrinkles.

These animals inhabit the rivers entering the sea and shallow coastal lagoons on both sides of the Atlantic, in tropical parts of West Africa and of eastern North and South America. The South American species ascends the Amazon and its tributaries well up toward their headwaters.

The Florida manati regularly frequents the coast from eastern Florida to Mexico, Central America, and the West Indies; in summer it sometimes strays as far north as the coast of Virginia.

This species attains an extreme length of more than 15 feet and a weight of more than 1,500 pounds, but the average size is much less. A large specimen exhibited alive at New Orleans the winter of 1912 weighed 1,310 pounds and is reported to have eaten daily from 60 to 100 pounds of grass. One captured near Point Isabel, Texas, measured a few inches more than 15 feet in length.

Manatis were formerly plentiful in the Indian River and elsewhere along the Florida coast, but were shot and netted to the verge of extermination. They were killed not only for amusement by thoughtless sportsmen, but many were killed by residents for their flesh, which was salted down like beef for future use. The flesh is said to be well flavored and not unlike beef.

The imminent danger of the extermination of these curious animals and their evident value for the interest they lend the coastal waters of the State led to the passage of protective laws with a penalty of $500. As a result of this, manatis have increased rapidly. A correspondent, writing on June 20, 1916, from Ponce Park, on Indian River, says that at this season scarcely an hour in the day passes but that from one to half a dozen may be seen in front of his house. He adds that one with a "calf" about 3 feet long keeps about his dock all the time. In this vicinity manatis appear to be migratory, leaving about the first of December and returning in early spring, the first one noted in 1916 appearing on March 26. They are extremely susceptible to cold, as was demonstrated by the number which perished in Indian River near Micco, February 12, 1895, when the temperature fell to 20° Fahrenheit. They are known to winter in Biscayne Bay and elsewhere in southern Florida.

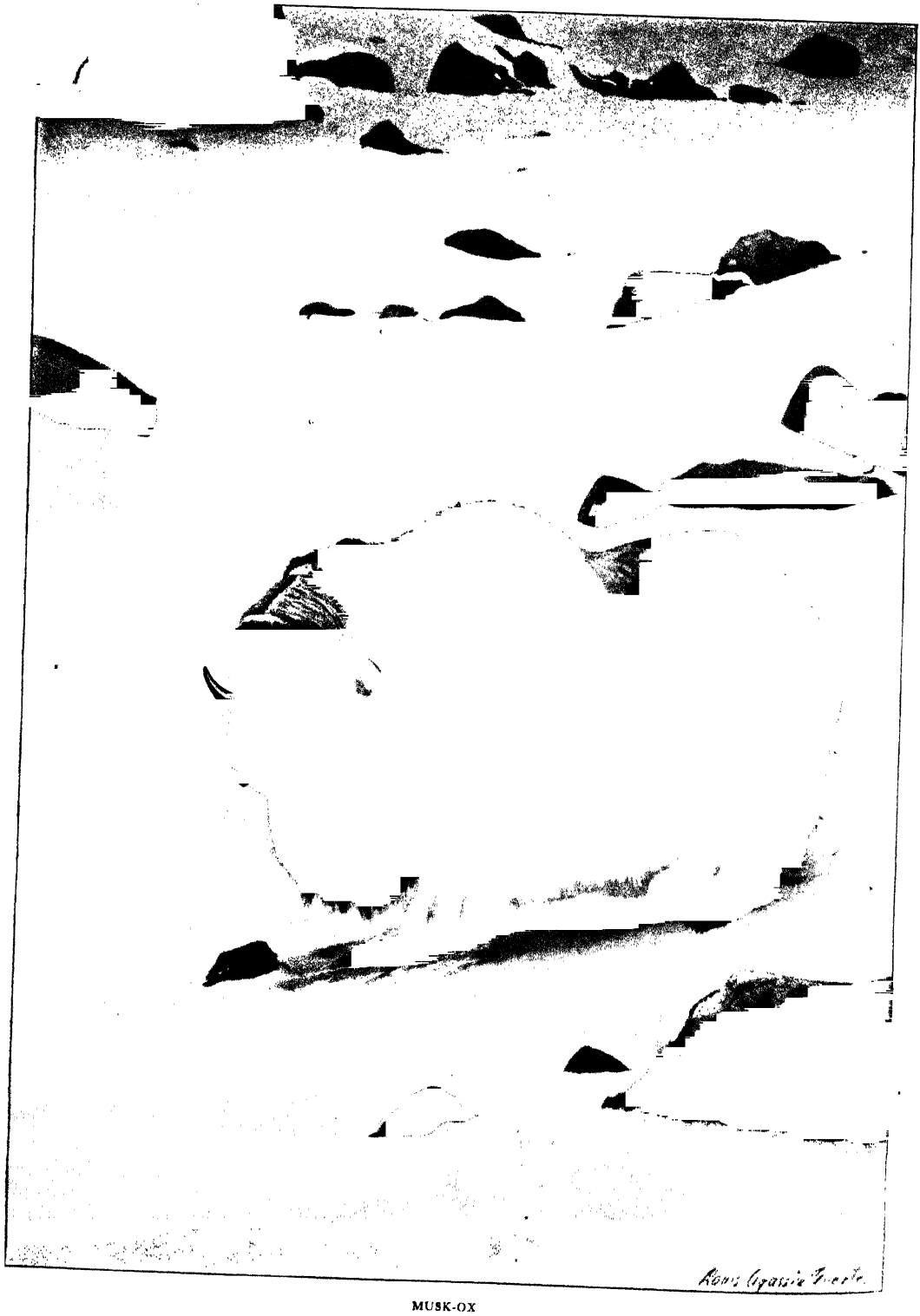
Within a few weeks after the manatis return to the vicinity of Ponce Park the young are born. Just before this the females are said to seek the protection of a dock, crib, or bridge, possibly in order that the new-born young may be safe from the sharks and sawfish which abound in these waters. Usually there is only one calf, which is about 30 inches long, but sometimes the mother is seen accompanied by two. During this season the females are scattered and, with their young, keep in comparatively shoal water near the shore, and not infrequently lie in shallow pools with half their bodies exposed. Later in the season they gather in herds and often 15 to 20 may be seen close together. At such times they roll about and make a great turmoil in the water. The Mexicans on the coast of southern Vera Cruz described to me similar summer gatherings of manatis in small lagoons and claimed they were there for the purpose of mating.

In fall, near Ponce Park, the larger animals, probably the old males, separate from the herds and roam about singly. At this time they often make a peculiar noise like a loud snort, which may be heard for half a mile or more.

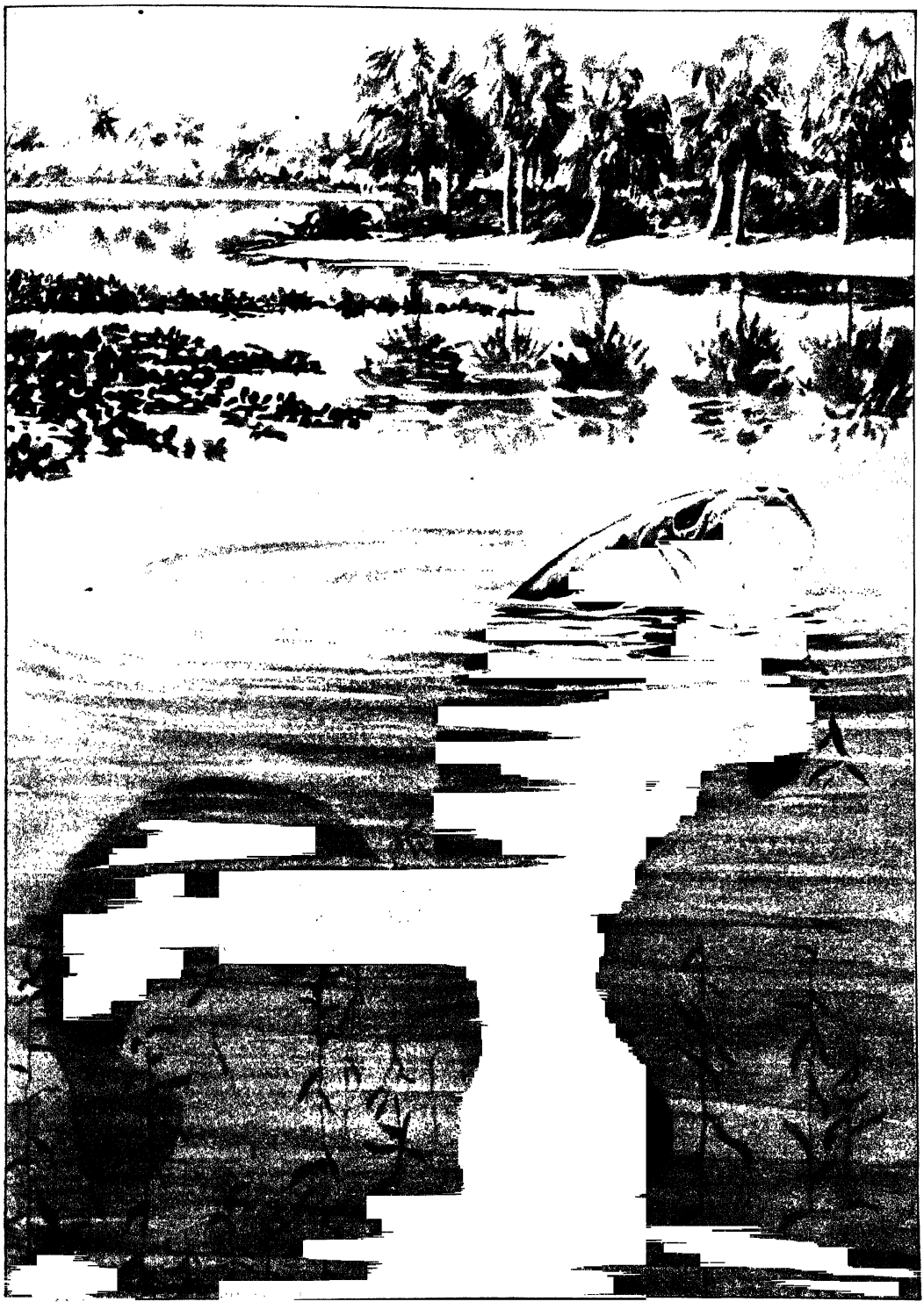
The Florida manatis are extremely mild and inoffensive animals, seeming never to fight one another, nor to show aggressiveness of any kind. When not molested they are very gentle and will feed close about a boat or dock regardless of the presence of people, but they become alarmed by any sudden noise. In captivity they soon learn to eat from their captor's hands.

Manatis are sluggish, stupid animals, without other defense than their size. They are not rapid swimmers and are among the extremely few herbivorous aquatic mammals. Unlike seals, whales, and their allies, which feed upon some form of animal life, manatis feed on the lush grasses and other vegetation springing from the oozy bottom of the waters they frequent. When feeding on the bottom they use their flippers to help move slowly about. In places along the Indian River they are reported to approach the shore and, with head and shoulders out of water, to feed on heavy grass-like plants hanging from the banks.

While they are feeding the heavy bi-lobed upper lips work freely and are sufficiently prehensile to seize the grass, or other plant food, between the lobes and thrust it back into the



MUSK-OX



FLORIDA MANATI

mouth. The ends of the flippers are sometimes used to help convey food to the mouth, like huge hands in thumbless mittens.

When suckling her young the manati rises to the surface, her head and shoulders out of the water, and with her flippers holds the nursling partly clasped to her breast. This semi-human attitude, together with the rounded head and fishlike tail, may have furnished the basis on which the ancients built their legends of the mermaids.

KILLER WHALE (Orcinus orca)

The killer whale is a habitant of all oceans from the border of the Arctic ice fields to the stormy glacial margin of the Antarctic continent. So far as definitely known, there appears to be but a single species. It attains an extreme length of approximately 30 feet and is mainly black with well-defined white areas on the sides and underparts of the body. Its most striking and picturesque characteristic is the large black fin, several feet long, standing upright on the middle of the back.

The killer usually travels and hunts in "schools" or packs of from three to a dozen or more individuals. Unlike most whales, the members of these schools do not travel in a straggling party, but swim side by side, their movements as regularly timed as those of soldiers. A regularly spaced row of advancing long black fins swiftly cutting the undulating surface of the sea produces a singularly sinister effect. The evil impression is well justified, since killers are the most savage and remorseless of whales. The jaws are armed with rows of effective teeth, with which the animals attack and devour seals and porpoises, and even destroy some of the larger whales.

Killers are like giant wolves of the sea, and their ferocity strikes terror to the other warm-blooded inhabitants of the deep. The Eskimos of the Alaskan coast of Bering Sea consider killers as actual wolves in sea form. They believe that in the early days, when the world was young and men and animals could change their forms at will, land wolves often went to the edge of the shore ice and changed to killer whales, and the killers returned to the edge of the ice and climbed out as wolves, to go ravening over the land. Some of the natives assured me that even today certain wolves and killers are still endowed with this power and, on account of their malignant character, are much feared by hunters.

Killers are known to swallow small seals and porpoises entire and attack large whales by tearing away their fleshy lips and tongues. When attacking large prey they work in packs, with all the unity and fierceness of so many wolves. The natives of the Aleutian Islands told me that large skin boats are sometimes lost in the passes between the islands by sea-lions leaping upon them in their frenzied efforts to escape the pursuit of killer whales.

The killers are specially detrimental to the fur-seal industry, owing to their habit of preying upon seals during their migrations in the North Pacific and during the summer in Bering Sea. They also haunt the waters about the Fur Seal Islands to continue their depredations during the summer. It would be a wise conservation measure for the Federal Government to have these destructive beasts persistently hunted and destroyed each spring and summer when they congregate on the north side of the Aleutian passes. Their destruction would not only save large numbers of fur seals, but would undoubtedly protect the few sea otters still remaining in those waters.

WHITE WHALE, OR BELUGA (Delphinapterus leucas)

The white whale, or beluga of the Russians, is a circumpolar species, limited to the extreme northern coasts of the Old and the New Worlds. The adult is entirely of a milk-white color, is very conspicuous, and as it comes up to "blow" presents an interesting sight. The young beluga is dark slate color, becoming gradually paler for several years until it attains its growth. The beluga usually lives in the shallow waters along shore, and not only frequents sheltered bays and tidal streams, but ascends rivers for considerable distances. Plentiful along the coast of Alaska, especially in Bering Sea and the Arctic Ocean, this whale also ascends the Yukon for a long distance. It also comes down the Atlantic coast and enters the lower St. Lawrence River.

The white whale is said at times to attain a length of 20 feet, but its ordinary length is nearer 10 or 12 feet. It travels in irregular "schools" of from three to ten or fifteen individuals and usually rolls high out of water when it comes up to breathe. It enters sheltered bays and the lower courses of streams, mainly at night, in pursuit of fish, which furnish its main food supply. During the twilight hours of the Arctic summer night, glowing with beautiful colors, the ghostly white forms of these whales breaking the smooth blue-black surface of a far northern bay add the crowning effect of strange unworldly mystery to the scene.

When on hunting trips in early autumn, I camped many times on the banks of narrow tide channels leading through the coastal tundra, and for hours during the darkness of night, as the tide was rising, heard the deep-sighing sound of their blowing, as schools of belugas fished up and down the current, often only 15 or 20 feet from where I lay.

The oil and flesh of the white whale is highly prized by the Eskimos, and they not only pursue it in kyaks with harpoon and float, but set large-meshed nets of strong seal-skin cords off projecting points near entrances to bays. Young or medium-sized animals are often caught in this manner, but powerful adults often tear the nets to fragments.

The beluga frequents broken pack ice along shore, and one trapped alive by the closing ice north of the Yukon early one winter was re-

ported by the Eskimos to have uttered curious squeaking noises when they attacked and killed it—an interesting fact, as the beluga is said to be the only member of the whale family to make vocal sounds of any kind.

When a school has its curiosity aroused by the approach of a boat or for any other cause, the members often raise their heads well out of water, one after the other, and take a deliberate look, then dive and swim to a safe distance before coming up again.

The small size of the beluga has long saved it from organized pursuit. Recently it has been announced that its skin has become valuable for commercial purposes, and that many are being killed. If this continues, these harmless and interesting animals are likely soon to disappear from most of their present haunts, unless proper measures can be taken to protect them from undue killing.

GREENLAND RIGHT WHALE, OR BOWHEAD (Balæna mysticetus)

The Greenland right whale is one of the largest of sea mammals, reaching a length of from 50 to 60 feet, and has a marvelously specialized development. Its enormous head comprises about one-third of the total length, with a gigantic mouth provided with about 400 long, narrow plates of baleen, or whalebone, attached at one end and hanging in overlapping series from the roof of the mouth. These thin plates of baleen rarely exceed a foot in width and are from 2 to over 10 feet long. One edge and the free end of each plate is bordered with a stiff hairlike fringe.

The northern seas frequented by these whales swarm with small, almost microscopic, crustaceans and other minute pelagic life, which is commonly so abundant that great areas of the ocean are tinged by them to a deep brown. These gatherings of small animal life are called "brit" by the whalers and furnish the food supply of the bowhead. The whale swims slowly through the sea with its mouth open, straining the water through the fringed whalebone plates on each side of its mouth, thus retaining on its enormous fleshy tongue a mass of "brit," which is swallowed through a gullet extraordinarily small in comparison with the size of the mouth. Among all the animal life on the earth there is not a more perfectly developed apparatus provided for feeding on highly specialized food than that possessed by the right whale—one of the hugest of beasts and feeding on some of the smallest of animals, untold numbers of which are required for a single mouthful.

The bowhead is a circumpolar species, which in summer frequents the Arctic ice pack and its borders, and on the approach of winter migrates to a more southerly latitude. For centuries this huge mammal has formed the main basis for the whaling industry in far northern waters, first in the Greenland seas and later through Bering Straits into the Arctic basin north of the shores of Siberia and Alaska.

Each large whale is a prize worth winning, since it may yield as much as 200 barrels of oil and several thousand pounds of whalebone. All know of the rise and fall of the whaling business, on which many fortunes were built and on which depended the prosperity of several New England towns.

Whaling served to train a hardy and courageous generation of sailors the like of which can nowhere be found today. They braved the perils of icy seas in scurvy-ridden ships, and when fortune favored brought to port full cargoes of "bone" and oil, which well repaid the hardships endured in their capture. Many a ship and crew sailed into the North in pursuit of these habitants of the icy sea never to return.

Interest in the brave and romantic life of the whalers still exists, though the most picturesque quality of their calling passed with the advent of steam whalers and the "bomb gun," which shoots an explosive charge into the whale and kills it without the exciting struggle which once attended such a capture by open boats.

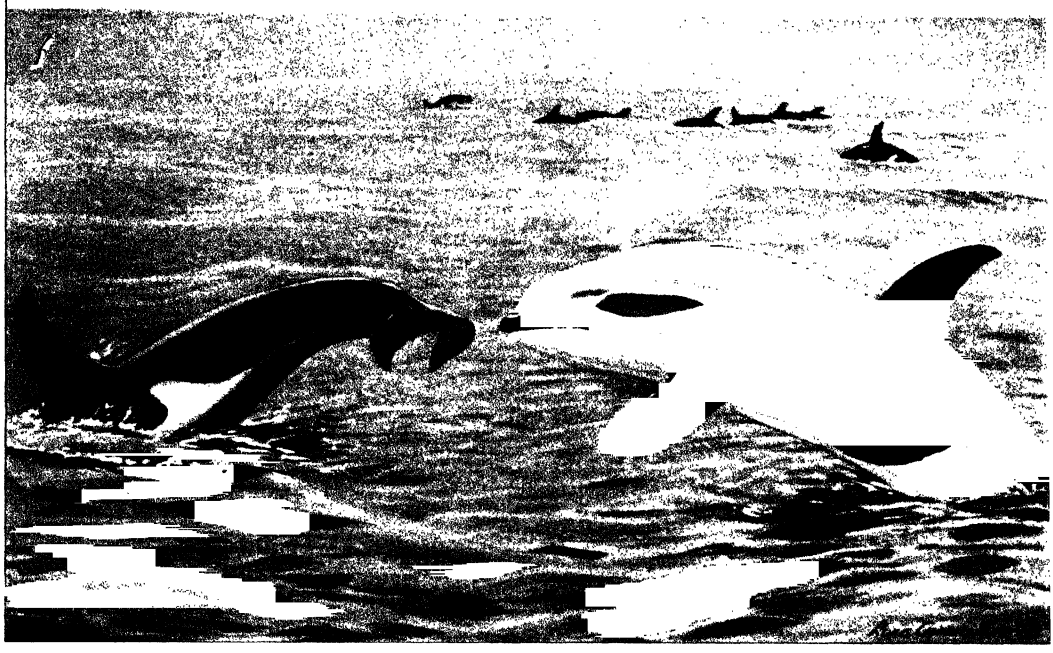
It has been well said that no people ever advanced in the scale of civilization without the use of some artificial illuminant at night. The world owes a great debt to the right whale and its relatives for their contribution to the "midnight oil," which encouraged learning through the centuries preceding the discovery of mineral oil. It also furnished the whalebone which built up the "stays" so dear to the hearts of our great-grandmothers.

The female right whale has a single young, which she suckles and keeps with her for about a year. She shows much maternal affection, and a number of cases are recorded in which the mother persisted in trying to release her young after it had been harpooned and killed.

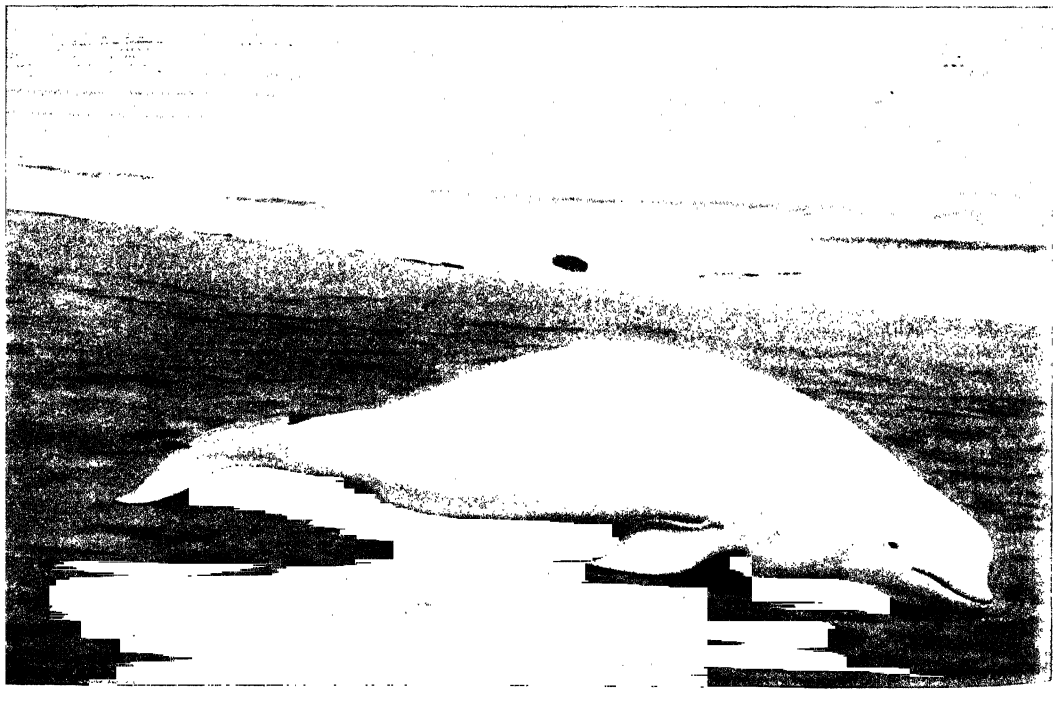
Every year, as the pack ice breaks up for the season, the bowheads move north through Bering Straits. As late as 1881 Eskimos along the Arctic coast of Alaska put to sea in walrus-hide umiaks, armed with primitive bone-pointed spears, seal-skin floats, and flint-pointed lances for the capture of these huge beasts. These fearless sea hunters, with their equipment handed down from the Stone Age, were sufficiently successful in their chase to cause trading schooners to make a practice of visiting the villages along the coast to buy their whalebone.

From one of the whaling ships encountered north of Bering Straits the summer of 1881 we secured a harpoon, taken from a bowhead in those waters, bearing a private mark which proved that it came from a whaling ship on the Greenland coast, thus showing conclusively that these whales in their wanderings make the "Northwest Passage."

Persistent hunting through the centuries has vastly decreased whales of all valued species, and the modern steam whaler is hastening their end. Their only hope of survival lies in wise international action, and it is urgent that this be secured in time.



KILLER WHALE



WHITE WHALE, OR BELUGA



GREENLAND RIGHT WHALE, OR BOWHEAD



SPERM WHALE, OR CACHALOT

SPERM WHALE, OR CACHALOT
(Physeter macrocephalus)

The cachalot is from 40 to 60 feet long, about equaling the Greenland bowhead whale in size. It has a huge blunt head, which comprises about one-third of the entire animal. The mouth is large and the under jaw is provided with a row of heavy teeth, consisting of ivory finer in grain than that from an elephant's tusk.

The great whaling industry of the last two centuries was based mainly on the sperm and the bowhead whales. The largest of the bowheads is limited to the cold northern waters, but the sperm whale frequents the tropic and subtropic seas around the globe. The main hunting area for them lies in the South Pacific, but they frequently visit more temperate coasts, especially when seeking sheltered bays, where their young may be born. The young are suckled and guarded carefully until old enough to be left to their own devices. Sperm whales sometimes occur off both coasts of the United States, especially off southern California.

The feeding grounds of these whales are mainly in the deepest parts of the ocean, where they cruise about in irregular schools containing a number of individuals. Their food consists almost entirely of large octopuses and giant squids, which are swallowed in large sections.

As befits a gigantic mammal possessing huge jaws armed with rows of fighting teeth, the sperm whale is a much more pugnacious animal than the bowhead. There are many records of whale-boats being smashed by them, and several well-authenticated cases of enraged bull cachalots having charged and crushed in the sides of whaling ships, causing them speedily to founder.

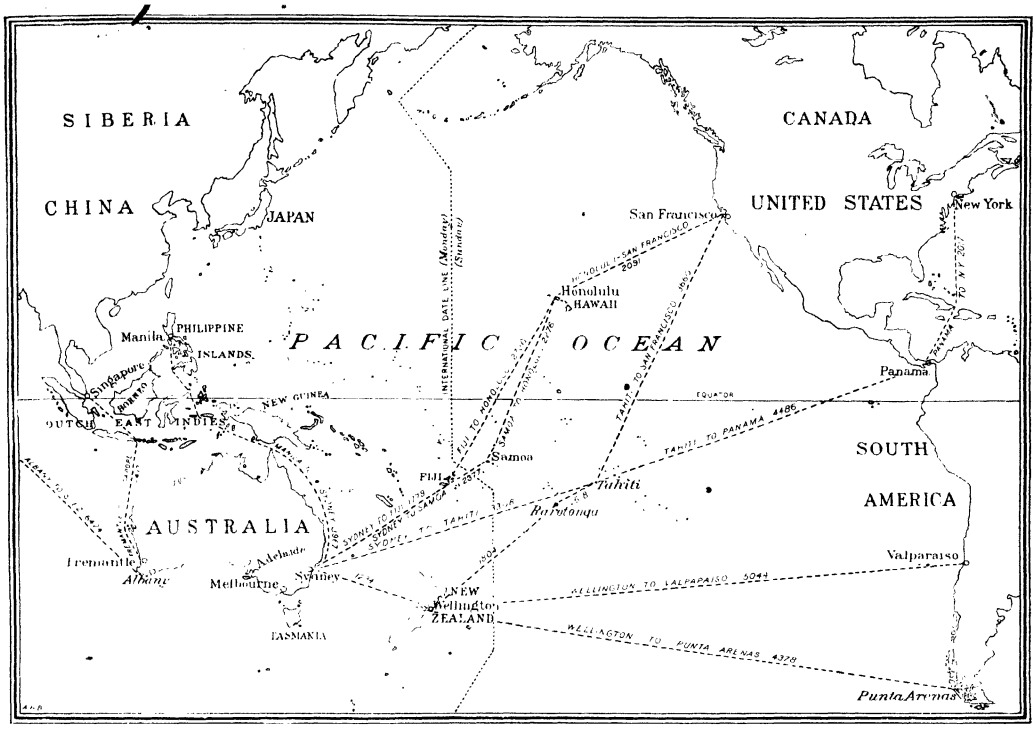
The sperm whale yields oil of a better quality than the bowhead. Its huge head always contains a considerable number of barrels of specially fine-grade oil, which produces the spermaceti of commerce. Ambergris, having an excessively high value for use in the manufacture of certain perfumes, is a product occasionally formed in the digestive tract of the sperm whale.

The name cachalot is one to conjure with. It brings up visions of three-year voyages to the famed South Seas, palm-bedecked coral islands, and idyllic days with dusky islanders. As in the case of the Greenland bowhead, however, this animal has been hunted until only a small fraction of its former numbers survives and the romantic days of its pursuit are gone, never to return.

THE LARGER NORTH AMERICAN MAMMALS

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Coyote, Mearns or Arizona	424	423
Coyote, Plains, or Prairie Wolf	424	423
Deer, Arizona White-tailed	457	458
Deer, Black-tailed	456	455
Deer, Mule	453	455
Deer, Virginia or White-tailed	456	458
Deer, White-tailed	456, 457	458
Elk, American	453	454
Eyra or Jaguarundi Cat	414	415
Fisher or Pekan	444	446
Fox, Alaska Red	418	417
Fox, Arctic or White	425	426
Fox, Cross	418	417
Fox, Desert	420	419
Fox, Gray	418	419
Fox, Pribilof Blue	425	426
Fox, Red	416	417
Fox, Silver	418	417
Fox, White or Arctic	425	426
Goat, Rocky Mountain	452	451
Jaguar	414	413
Lion, Mountain	412	413
Lynx, Bay	410	411
Lynx, Canada	410	411
Manati, Florida	465	467
Moose	461	463
Muskhog or Peccary	448	447
Musk-ox	464	466
Ocelots or Tiger-cats	416	415
Opossum, Virginia	408	409
Otter	445	446
Otter, Sea	431	433
Peccary, Collared, or Muskhog	448	447
Pekan or Fisher	444	446
Raccoon	408	409
Sea elephant, Northern, or Elephant Seal	431	433
Sea-lion, Steller	429	433
Seal, Alaska Fur	429	433
Seal, Elephant, or Sea-elephant	431	433
Seal, Greenland, or Harp Seal	433	435
Seal, Harbor	433	436
Seal, Harp, Saddle-back, or Greenland	433	436
Seal, Leopard, or Harbor Seal	433	436
Seal, Ribbon	435	438
Seal, Saddle-back, or Harp Seal	433	436
Sheep, Dall Mountain	449	450
Sheep, Rocky Mountain	448	447
Sheep, Stone Mountain	449	450
Tiger-cats or Ocelots	416	415
Walrus, Pacific	427	430
Wapiti or American Elk	453	454
Whale, Greenland Right or Bowhead	469	471
Whale, Killer	468	470
Whale, Sperm, or Cachalot	472	471
Whale, White or Beluga	468	470
Wolf, Arctic White	422	421
Wolf, Black		423
Wolf, Gray or Timber	422	423
Wolf, Prairie, or Plains Coyote	424	423
Wolf, Timber or Gray	422	423
Wolverine	427	428



MAP SHOWING THE ISOLATION OF AUSTRALIA (SEE PAGE 474)

while the aborigines of Australia are the lowest in intelligence of all human beings.

Australia is in no sense inferior to New Zealand in geographic interest, but lofty peaks, profound canyons, and active volcanoes are lacking; its rivers are unimpressive and its permanent lakes small and few in number; it is a continent composed of plains interrupted by ridges and mountain knobs.

Unique vegetation, of remarkable variety and beauty (see page 486), animal life of by-gone geological periods (see page 502), and an aboriginal population, the lowest in the scale of beings having human form, stand out as features distinctly Australian—a never-ending source of interest to the geographer.

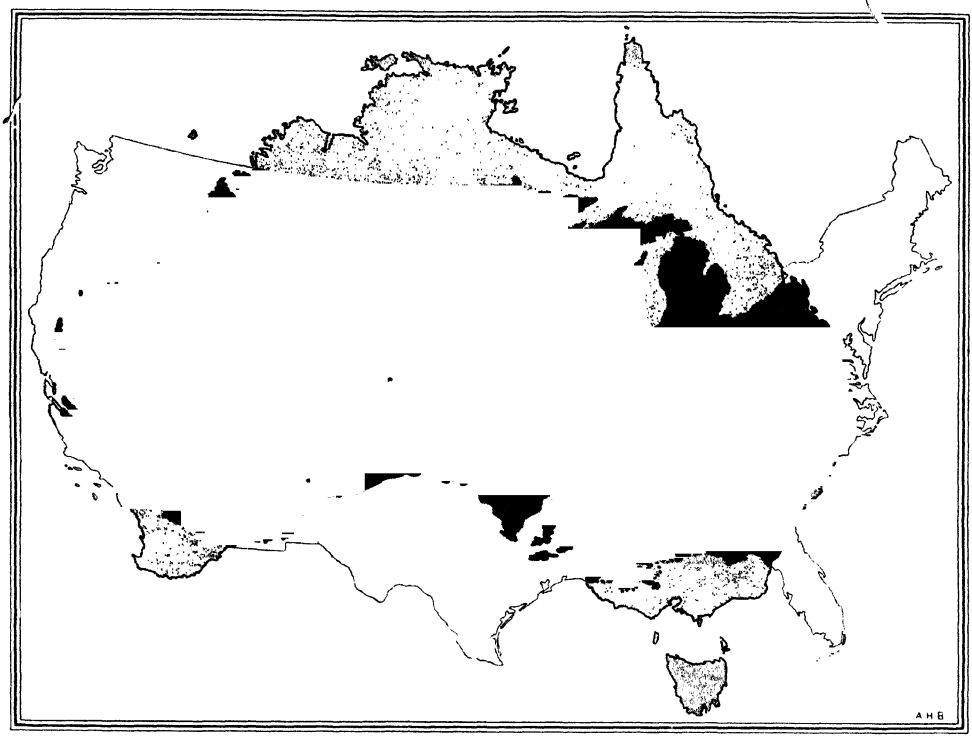
Australia is a large country. It is about fourteen times the size of France or Germany, twenty-five times the size of Italy, Hungary, or Ecuador, and two and one-half times the size of Argentina! its chief competitor in the Southern Hemisphere. Its area is equal to three-fourths of Europe, one-third of all North America, and one-fourth of the British Empire.

SOME COMPARISONS WITH THE UNITED STATES

The continent is almost exactly the size and is nearly the shape of the United States (see map, page 476).

Of outlying provinces, Australia has the tropical land of Papua to offset arctic Alaska. The Commonwealth is responsible also for the rich little Lord Howe Island and for 800 inhabitants of Norfolk Island, descendants of Tahitian women and British sailors—mutineers of the famous ship *Bounty*.

Australia is the most level in surface and regular in outline of all the continents, and even of most large islands. It is also the lowest continent, with an average elevation about that of Ohio. Its surface lacks variety. The change from one type of topography is so gradual and significant natural features are so few and so widely spaced that, with the exception of the Murray River, they are



OUTLINE MAP OF AUSTRALIA ON OUTLINE OF THE UNITED STATES, TO SHOW RELATIVE SIZES

If we except the lakes, the land area of the continental United States is 2,973,800 square miles, and of Australia 2,974,581 square miles, a difference in favor of Australia of 691 square miles.

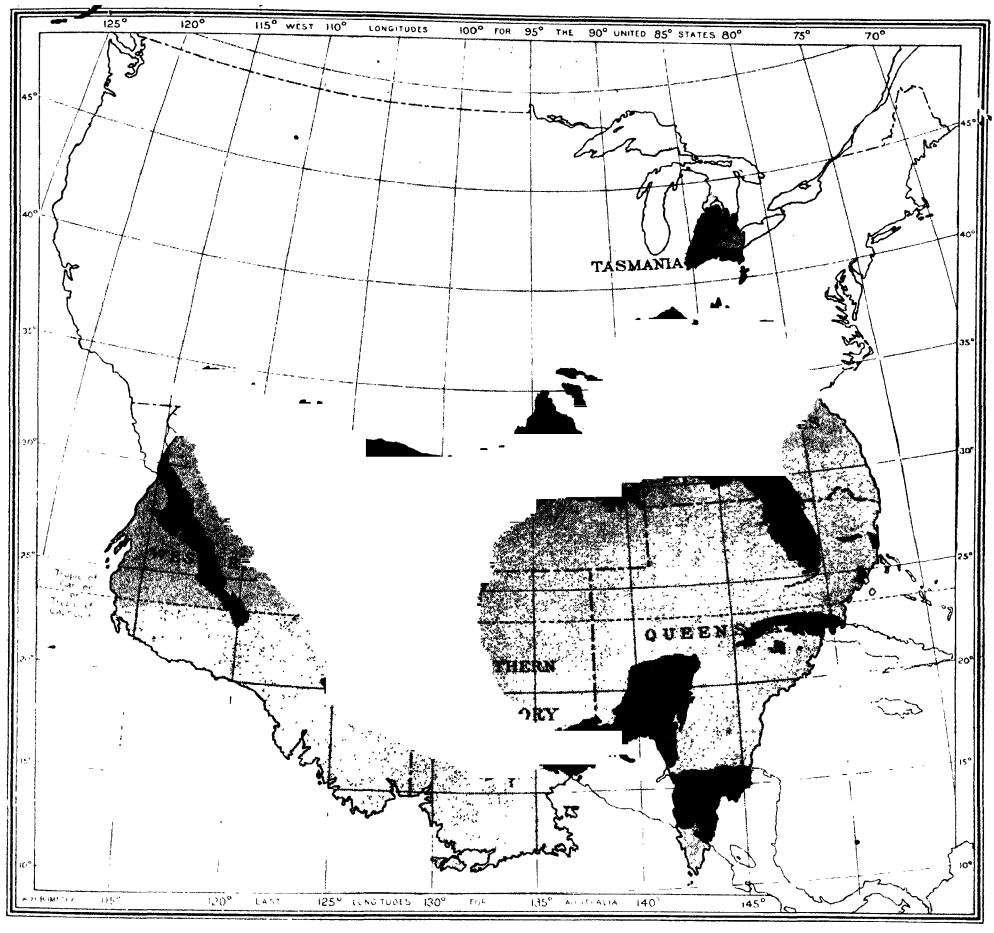
not utilized in marking the boundaries of States.

Except for the low coastal mountains, the obstructions to transcontinental railroads from Queensland to Perth or from Port Augusta to Port Darwin are less than those between Pittsburgh and Denver (see also page 489).

The traveler in search of duplicates of the Canadian Rockies, the Yosemite, the Grand Canyon, of Norwegian fiords and Alpine scenery, need not visit Australia. Its mountain scenery is that of the southern Appalachians, the White Mountains, and the low ranges of Arizona. Its plains and plateaus are comparable with those of the Rocky Mountain foothills and the arid expanses of Utah, Idaho, and Oregon. The blunt granite cap of Mt. Kosciusko, 7,328 feet above sea, is the culminating point of land. A half dozen peaks reach the height of Mt. Washington, and something like one per cent of the entire land area rises as high as the Catskills.

Although the mountains are low compared with those of other continents, their influence is great, for nowhere is their control of rainfall and consequent distribution of vegetation and people better exemplified. A bird's-eye view of Australia shows a belt of vegetation extending along its north, east, and southeast edges, with a patch on the extreme southwest corner and another covering most of the island of Tasmania. In these regions the people live. The remainder of the big island presents an enormous expanse of brown and gray soils and rock, dotted with patches of vegetation on dunes and on isolated highlands and strips of green along watercourses.

The cause is not difficult to find. The trade winds abundantly supply the northeast coast, but carry little water beyond;



OUTLINE MAP OF AUSTRALIA SUPERPOSED ON OUTLINE OF PART OF NORTH AMERICA OF SAME SCALE, IN CORRECT LATITUDE

Only one-twentieth of the total area of Australia lies in a latitude farther removed from the Equator than Chattanooga, Tennessee, Clarendon, Texas, and Albuquerque, New Mexico. Considerably less than one-third of its area lies in a cooler latitude than the sugar-cane lands of Louisiana.

the westerlies, the "roaring forties" of the sailor, deposit their moisture on the lands along Bass Strait and on the southwest tip of the continent, but have little or none to carry inland. The north coast is alternately drenched and dried with the coming and going of monsoons. The center of the continent is therefore arid, large parts are desert, and the numerous large lakes shown on the map are expanses of salt mud covered with water by infrequent rains (see page 488).

Australia's streams are fewer and carry less water than those of any other continent.

AUSTRALIA HAS NO RIVERS LIKE OURS

There are in Australia no Colorados or Columbias or Tennessees, trenching plateaus and crossing mountain chains, and no counterparts of the thousands of spring-fed brooks and streams issuing from lakes widely scattered over the country. The St. Lawrence system of lakes and rivers of large volume and steady flow is the very antithesis of anything found in Australia. The large area in Utah and Nevada from which dwindling streams never escape to the sea is represented in Australia by an enormous



THE HIGHEST PEAK IN AUSTRALIA, MOUNT KOSCIUSKO (7,328 FEET), AND THE UPPER MURRAY RIVER: VICTORIA

expanse of territory, comprising fully half of the continent.

The heart of the United States is a well-watered land of fields and woods and cities; the corresponding part of Australia is dry and barren and thinly populated.

The Murray-Darling is the one great river system of Australia. From the source of its uppermost branch, the Condamine, in the highlands of Queensland, 80 miles from the edge of the continent, to its mouth, through the sand reef of the Coorong, the stream travels 2,310 miles, receiving supplies from 414,000 square miles of land. It drains five-sixths of New South Wales, more than one-half of Victoria, and nearly one-seventh of the entire Australian Continent (see map on pages 480-481).

In relative length and area drained, it is the Missouri-Mississippi of Australia; but in other respects the two systems are quite unlike. The Mississippi, whose basin occupies nearly three-sevenths of the United States, flows through the heart of the country and receives abundant water from mountains on either side. The Murray is on the edge of the continent, far removed from the interior; its course lies between well-watered highlands on the east and arid plains on the west. The Mississippi receives supplies from nearly every part of the 1,250,000 square miles of its basin; the Murray receives effective contributions from only 160,000 square miles; from the remaining 254,000 square miles the water is lost before it enters the main stream, and the dry air abstracts further toll from the river itself.

Instead of a delta pushed out to sea, the Murray terminates in a lagoon inclosed by a barrier of sand pierced by an inlet with scarcely seven feet of water.

Because of its unfavorable outlet, its small volume, its snags and sand-bars and great sinuosities, navigation of the Murray is limited to small, light-draft steamers towing one or two barges. Regular traffic in grain and wool is maintained during seven months of the year from the mouth of the river to Wentworth, 500 miles, and small boats reach Albury.

During times of exceptional floods boats have reached Walgett on the Darling, 1,900 miles from the sea. In the flood year of 1870 a steamer went beyond the Queensland border along a river 60 miles wide, and in 1890 steamers on the Darling between Wentworth and Burke "traveled for hours without seeing any land, and in one instance discharged cargo 25 miles from the ordinary channel of the river." But a few years later (1902-1903) the Darling ceased to flow for eleven months. During exceptional years the bed of the Murray is partly dry and the waters near its mouth become too salt for stock.

THIS GREAT CONTINENT WAS NOT DISCOVERED UNTIL JUST BEFORE OUR REVOLUTION

That the size and form of a land-mass nearly as large as Europe should have remained unknown until 1770 is most remarkable.

Louis de Torres, sailing from Peru (1606), thought the northern Queensland coast another of those island groups (Marquesas, Solomon, New Hebrides) through which he had passed. The Dutch proceeding from Java several times met the west and north of Australia, but learned little regarding the land. They reported a "barren," "wild" country, inhabited by "barbarous," "cruel," "black" people. Abel Tasman, in 1642, found Van Diemens Land, Tasmania, which he left in disgust. Following the westerly winds he sailed east, found New Zealand, but missed the Australian coast.

In 1688 William Dampier, an English buccaneer, landed in West Australia, and the following year mapped the coast, which he described as "sandy and waterless," with stunted trees, inhabited by "the miserablest people in the world."

These early explorers were singularly unfortunate in the route which they traversed. They visited the tropical belt of northern Australia, the inhospitable shores of western Australia, and sailed along the southern coast, where cliffs prevented landing and where for a distance of nearly 1,000 miles no water was procurable other than that from their ships. The attractive parts of the country were not seen at all. Small wonder that little

was heard of the Great South Land for nearly one hundred years after Dampier made his official report to King William.

One is minded to compare the experiences of these Pacific navigators with those of the discoverers of North America. The English and Dutch, like their predecessors, the Spanish, found the North Atlantic seaboard "pleasant land," well watered, clothed with vegetation, with obviously fertile soil, inhabited by a virile race. If Columbus had first landed on the barren shores of Lower California, explored the Gulf of California, and sent scouts into the Sonoran and Gila deserts, the story to be told of a new world would have had a far different wording.

The uncertainty surrounding the distribution of land in the South Pacific was dissolved by the English scientific expedition of 1768-1770, under Captain Cook. After circumnavigating the islands of New Zealand, Cook set his course westward toward Tasmania, but, luckily, was carried by storm winds to the east coast of Australia. Proceeding northward, he discovered the Great Barrier reef, and passed through Torres Strait, proving Australia to be a land-mass of great dimensions. Cook's expedition revealed for the first time the presence of wide belts of fertile land in Australia, and his landing at Botany Bay, Sydney, April 28, 1770, was destined to result in acquiring a continent for the British Crown.

THE SETTLEMENT OF AUSTRALIA RESULTED FROM THE AMERICAN REVOLUTION

Curiously enough, the establishment of the first colony on the new-found continent is an episode in the history of the United States. It was proposed by the British Government to utilize the land as a home for the "Loyalists" (Tories) who found life in the American Colonies uncomfortable at the close of the Revolutionary War. They were to be supplied with land and money, and Malay slaves or English convicts were to be provided as laborers.

Fear of the French fleet and the revolt of many Tories to Canada led to abandonment of this scheme, but another use for Botany Bay was soon discovered. Place must be found for undesirable citizens, who, before the Revolution, had been sent to America at the rate of one thousand a year, and New South Wales met the requirements. The history of Australia begins with the year 1788, when ten hundred and thirty-five convicts under military escort landed at Sydney Cove.

In looking back over the history of the original settlement at Sydney, at first it seems strange that the base of the Blue Mountains, a plateau 3,000 feet in height and a day's ride from the coast, should mark the edge of known land for twenty-five years after colonization.

There are, however, good reasons for this seeming lack of enterprise. The Blue Mountains, though not lofty, are broad, and constitute a formidable barrier. There are no long valleys heading in practicable passes and furnishing access from the east and the west; the stream heads are boxes inclosed by walls, and it was only when the narrow divides were chosen for causeways that the passage of the mountain was successfully accomplished (see page 487).

The famous "zigzags" of the first railroad, now replaced by a dozen expensive tunnels required for the precipitous descent of 2,000 feet, give even the casual tourist an impression of the ruggedness of the plateau; and when one is led out onto one of a hundred flat-topped promontories and gazes down into canyons whose walls may be scaled only by an experienced mountaineer and looks out over a tangle of canyons and cliffs and tables at lower levels, he realizes that "magnificent scenery" for the present generation must have been "disheartening obstacles" to the scout in search of tillable land.

It is as if the only feasible crossing of the Appalachians which confined the American colonists to the coastal belt were through the most rugged portion of West Virginia rather than along the Mohawk or through the Cumberland Gap.

The drought of 1813 appears to have been the force which compelled the leaders of the now prosperous colony to undertake a systematic search for new lands among and beyond the barriers which held them close to the sea.

The history of the effort to discover what lay back of these coastal regions in the "land of the never-never"; to find the

nature and extent of the heritage now firmly in English hands is a disheartening but fascinating story. Whatever route was chosen the results were the same: tales of hardship and disaster and reports of no good land.

TALES OF UNSURPASSED COURAGE

One of the most dramatic incidents was the discovery of the Darling River by a group of worn-out, disheartened men traversing a scorched, waterless plain. A great river was found, but its waters were salt! The experience of Sturt's men carried involuntarily through the gorge of the Murrumbidgee into the broad channel of the Murray; their journey to the sea down an unknown river which followed an undreamed course, and their arduous return up 800 miles of current, with the scantiest of fare and amid hostile blackfellows, constitutes a record of endurance and resource comparable with Powell's descent of the Colorado canyons.

Parties from Sydney found little of value beyond the Darling; Bourke and Wills from Melbourne perished of starvation on Cooper Creek. Leichhardt disappeared utterly. From Port Lincoln and Adelaide, Eyre traversed the coast of South Australia, finding only three waterholes in 300 miles, and penetrated to the center of that State only to discover its watercourses dry and its lake beds coated with brine. Stuart, in 1862, succeeded in making a complete traverse of the continent from south to north, but found little on which to base the nation's future.

From the tropical portions of the Commonwealth came the same tale. The settlement established on Melville Island in 1824 was abandoned in 1829, in spite of the rich soil, good surplus of fresh water, and abundance of tropical fruit. Fort Wellington, on Raffles Bay, retained its colonists for only three years. Kennedy, on York peninsula, was killed by the natives; his companions starved to death.

As a record of human endeavor the explorations of Australia during these years constitute a chapter in history for which the United States has no parallel. The pioneers who crossed the Alleghanies found fertile country beyond; the trappers and traders on our northern boundaries were in country abundantly supplied with food and water; the men who pushed their way across the great plains had forage and water for their animals and wild game for themselves. The forty-niners who crossed the deserts of Utah and Nevada were encouraged by knowledge of California beyond. Only the Spanish explorers from Mexico and pioneer travelers through the deserts of Arizona and southern California can appreciate the suffering and understand the failures of the heroic Australian scouts.

To the colonists grouped about the five cities on the mainland the results of these explorations between 1840 and 1860 must have been disheartening. The center of the great continent, which their hopes had pictured as grass-covered plains, fertile valleys, lakes, and timbered highlands, interspersed perhaps with arid stretches, had turned out to be one of the most extensive deserts in the world, into which streams rising near the coast were lost in a sea of rock and sand.

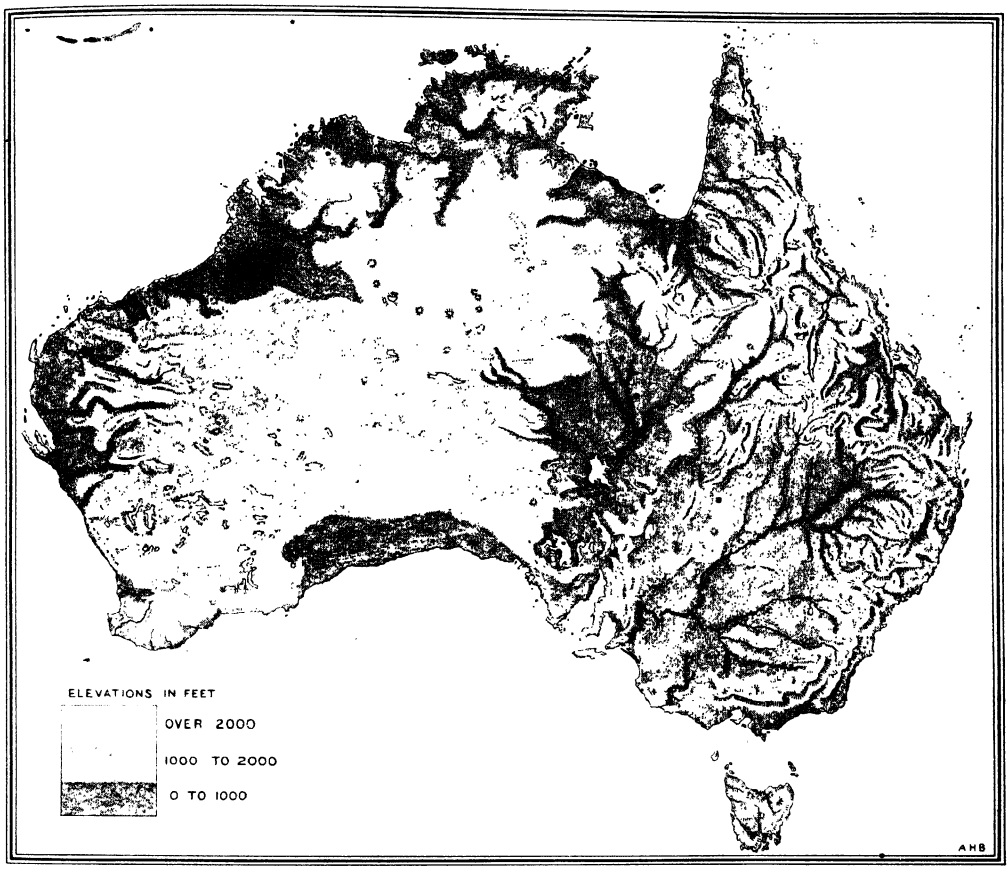
It is as if the people of the United States should wake up some morning and find that all the land between the Alleghanies and the Sierra Nevadas had been converted into plains like the arid stretches of Utah.

However, persistent explorations gradually disclosed to the Australians that their continent, in spite of its arid expanse, had well-watered agricultural lands for many millions of peoples, and that the resources in timber and ores and grazing lands were unusually large.

FORESTS OF ANCIENT LINEAGE

To me the most lasting impressions of Australia are of its wonderful woods. One readily understands why the Australian loves his trees. The groves of giant eucalyptus form pictures never forgotten, and the scent of the wattle brings a homesick feeling like the smell of the sage to a Westerner.

The flora is not only beautiful, it is unique, and has no counterpart in other lands. Of the 10,000 species of plants most of them are purely Australian, and are unknown even in New Zealand. The general impression one gets of Australian



PHYSICAL MAP OF AUSTRALIA

The very small area in Australia having an elevation of more than two thousand feet is clearly shown. Perhaps more striking even than this is the fact that, except for a very tiny area lying back of the coast in the southeast corner, there are no elevations exceeding four thousand feet.

and that geologic history is a common subject of study in schools; but I sometimes wonder why the kangaroo and emu occupy the commonwealth coat of arms to the exclusion of the gums and the wattle, about which the finer sentiments of Australia center.

AUSTRALIA'S NATIONAL TREE

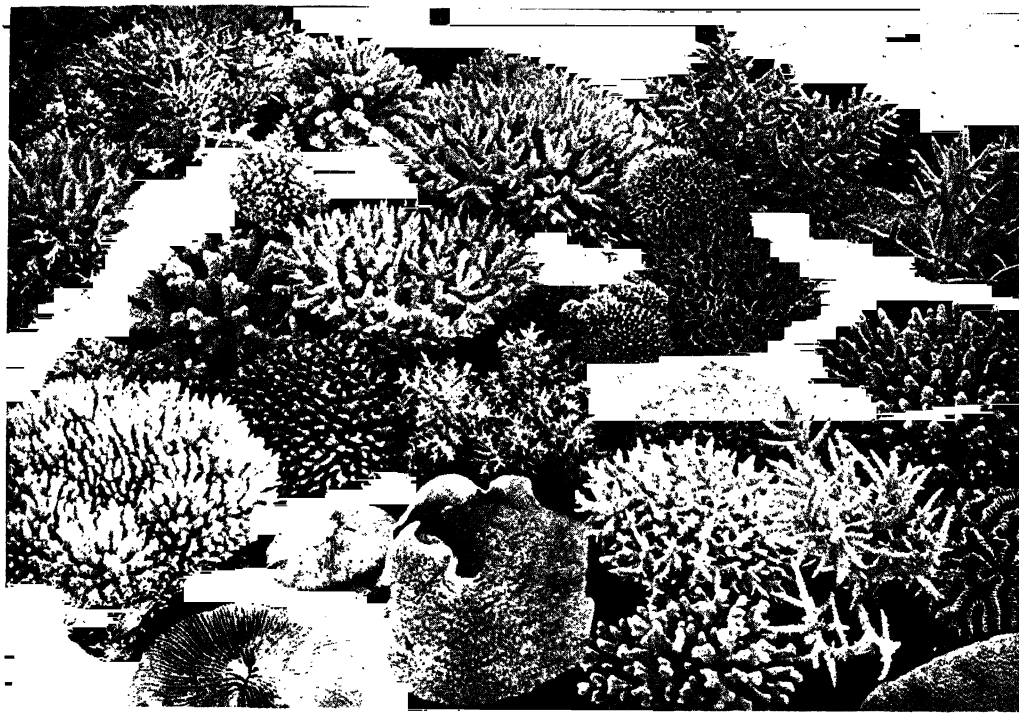
Australia is the home of the wonderful eucalyptus, a tree about which a fair-sized library of books and pamphlets has been written, without exhausting the subject. For geological ages the eucalypts have remained undisturbed in this "biological backwater," and, spreading over the continent, have adapted themselves to many varieties of soil and climate and elevation. About 300 species have already been discovered in the small part of the continent explored by botanists.

It is a hopeless task for the tourist to gain an acquaintance with this national tree. As we passed through woods and open spaces, seeing trees of widely different aspect—different in form and method of branching, different in color and kind of bark, different in shape and size and color of leaf, some oozing gum, others clean and dry—it was disconcerting to be quietly told by our botanist-guide that this surprising array of trees "includes only varieties of the genus eucalyptus." It is as if the traveler in New England were



BALANCING ROCK: NEW SOUTH WALES

Australia is a land of the strange and curious, unlike any other on earth. While both its fauna and flora are unusual to a startling degree, its geology is unique. Science claims for it the distinction of being one of the oldest land surfaces.



CORALS FROM THE AUSTRALIAN BARRIER REEF, NORTH QUEENSLAND

Ages of time and the lives of myriads of coral polyps have gone to make up countless forms like these in the Great Barrier Reef off the coast of Queensland, the largest coral formation in the world, 1,200 miles in length. The explorer Captain James Cook almost lost his ship on the reef in 1870; but today, when the openings through it are known and charted, as well as the channel which it protects, the barrier is regarded as a boon to coasting vessels.

told that all the maples, oaks, chestnuts, elms, birches, and cedars, and even apples and cherries, were but species of the genus hickory.

The Australian is likewise embarassed by these prolific variations of eucalyptus. The trees in general are "gums"—white gums, red gums, blue gums, spotted gums, cabbage gums—or ironbark, stringy bark, woolly bark, smooth bark, and when distinctions are necessary we get such combinations as narrow-leaved-red-ironbark, or broad-leaved-yellow-stringy-bark.

LEAVES THAT GROW VERTICALLY INSTEAD OF HORIZONTALLY

Where conditions are favorable, the eucalypts form forests of straight, slender trees; where soil is poor, they are wide-spaced and branch like the California oaks; on sand plains they develop an enormous root, from which spring a number of thin round stems leading to a canopy of scattering leaves; and even where soil and rain are practically absent the genus is represented.

Eucalypts are evergreens, which shed their bark, but not their leaves; but they are not shade trees. The leaves are placed in inclined rather than in horizontal positions, and the passage of light is but little obstructed. For this reason, smaller trees and bushes and grass grow underneath, and the woods in places assume the appearance of a jungle from which arise the towering shafts of trees. It is interesting to note that primitive types of eucalyptus, as well as the young of more modern types, have horizontal leaves, pointing to a time in the geologic past when the climate was more congenial and no precautions to conserve moisture need be taken.

The eucalypts include some of the tallest trees in the world. The Victorian Forests Department records trees which



Photograph from Janet M. Cummings

A FERN-TREE GULLY IN VICTORIA, AUSTRALIA

No other continent is so rich in ferns as Australia. Just as its long isolation kept out the animals of other continents and allowed species of old geologic ages to persist, so also that isolation has resulted in the continuance of plant forms there that have lost the race for existence in other continents. Among these are some of the great tree ferns that are met with elsewhere only in fossil form.



Photograph by N. J. Caire

GIANT TREE BRIDGE OVER RIVER TARWAN: GIPPSLAND, VICTORIA

Australia's trees are largely forms that lived and became extinct in our own land more than one million years ago



A FOREST SCENE (GROUP OF TURPENTINE TREES) : NEW SOUTH WALES

Eucalyptus trees grow about seven times more rapidly than oak or hickory, and they also reproduce themselves even more readily than these popular American trees. Their strength is twice that of the English oak. Note the man.

measure 329, 333, and 342 feet, and states that there are "scores of trees about 300 feet in height." The surveyor of the Dandenong ranges made notes of the tallest trees felled during an eight-year period and reports that "all those measured were over 300 feet in length."

Eucalyptus trees reproduce themselves readily and grow about seven times more rapidly than oak or hickory. From a ton of bark of the gimlet tree was obtained by analysis 416 pounds of tannin extract and 308 pounds of oxalic acid. From the gum and leaves of these trees come also the highly valuable eucalyptus oils, from which no less than twenty-seven constituents have been distilled for pharmaceutical purposes and for the separation of metals by the flotation process.

The eucalyptus is the great timber tree of the continent. Of sixty varieties in Victoria, twenty have high commercial value and are finding an ever-increasing market. The Tasmanian blue gum is one of the strongest, densest, and most durable woods in the world. Timbers 2 feet square, exceeding 100 feet in length, are readily obtained, and, when used for piling, need not be weighted, for the density of the wood is such that it sinks in water.

THEIR STRENGTH REMARKABLE

Their strength is twice that of English oak, and they are practically immune from attack by the Teredo, which plays such havoc with ordinary timbers. In Tasmania railroad ties or paving blocks of blue gum and stringy bark have a life of fifteen to twenty years—three times that of ordinary woods. In the dryer climate of Victoria blue-gum sleepers have been in service for nearly forty years. Shingles from peppermint gum have a life of thirty to forty years.

The jarrah, a eucalyptus of West Australia, is another famous tree. It is one of the few woods of the world which successfully resist the ravages of white ants; it is practically immune from the attacks of marine borers, and, like the iron bark of Victoria and New South Wales, has been known to withstand fire better than iron girders. Piles of sawn jarrah driven at Port Adelaide in 1868 "showed no signs of decay in 1910."

The forests of West Australia also supply the karri, one of the world's big trees. It is straight and tall, reaching heights of 300 feet and 120 to 180 feet to the first branch. Like the jarrah, its timber is widely used where strength and durability are requisites. The karri planking of a dismantled ship, which had plowed the seas for thirty years, was sawed into blocks and used for paving. A log of karri which had lain forty-six years in mud below high-water mark was found by a Royal Commission to be "perfectly sound." Their life as railroad ties is twenty-five to thirty-five years.

AUSTRALIA DESTROYING HER TREES

In view of the present and prospective value of Australia's national tree, it is a little surprising to find that cutting and burning is proceeding with scant scientific supervision. California and South America are planting eucalypts; Australia is cutting them down.

Australian hardwoods rival mahogany in beauty and susceptibility of polish, and are unsurpassed among the world's timbers in strength, durability, and resistance to fungous and insect attacks.

But soft woods for ordinary construction purposes are not abundant, and the imports of lumber are correspondingly large. During 1913 timber to the value of $10,000,000 reached the commonwealth from foreign parts, 70 per cent of it from the United States; in return, Australia exported undressed hardwoods of about half that value chiefly to New Zealand, South Africa, India, and England.

One effect of the scarcity of suitable lumber is shown in the extensive use of galvanized iron in building. Iron replaces shingles for roofing, and in parts of the country practically no other building material is used.

THE ANIMALS OF OTHER CONTINENTS—HORSES, CATTLE, PIGS, TIGERS, LIONS—UNKNOWN IN AUSTRALIA

The animals of Australia are so distinct from the rest of the world that some have proposed two great zoölogical realms: Australian and non-Australian. The peculiarity lies not only in the fact that Australian types are not found elsewhere, but also that families like the cats and



FOREST TWINS: AN IRONBARK AND A SPOTTED GUM

The ironbark is a species of the eucalyptus, very highly prized in work requiring great strength and durability. Often it is preferred to steel and iron for girders and supporting columns, since it is almost impervious to fire and does not bend or buckle when exposed to unusual heat.

the pigs, which are found native on all other continents and on many islands, are absent from Australia.

The continent has so long been isolated that the passage for animals from other land-masses has been closed for millions of years. Species and genera have evolved, and some even disappeared, in other continents, while Australia remained apart, and so it comes about that most of the forms known in other lands are represented neither by living nor by fossil species. The barrier of water which protects Australia from animal immigrants from other countries was formed at the beginning of the "Age of Mammals," before the prominent elements in the world's fauna—cats, swine, horses, cattle, sheep, elephants, camels, rats, rabbits, bears, monkeys, etc.—had originated. These, therefore, are not native to Australia, which possessed mammals of only the most primitive types.

THE WORLD'S STRANGEST ANIMALS

The great animal groups—the lizards, tortoises, snakes, birds, fishes, crabs, etc.—which developed in geological periods before the land bridges to other countries had been destroyed, are represented in Australia, but they have evolved along distinct lines, and most of the genera and species are peculiar to the continent.

The most primitive order of mammals, the monotremes, are confined to Australia. There is the platypus, a strange beast which lays eggs like a turtle, but suckles its young; has horny pads for teeth and a bill like the duck; its front feet are webbed, and both back and front feet have claws. Little wonder that he has received many names, or that his scientific designation is *Ornithorhynchus paradoxus* (see page 498).

The spiny ant-eater is another strange mammal. He looks and acts like a hedgehog, but he has a long beak and a longer tongue, covered with a sticky substance, with which he captures quantities of ants. He not only burrows vertically into the ground with great rapidity, but also climbs with surprising agility. Like the platypus, the spiny ant-eater lays eggs which are hatched in a pouch and the young reared on the mother's milk.

The kangaroo is Australia's national animal, and the group to which it belongs, the marsupials, is typically Australian. Marsupials—mammals whose young are born very immature and then transferred to a pouch and suckled—have been long extinct in Europe and are represented in America by unimportant survivors, like the opossum. They belong to a past geological age, and have survived and flourish in Australia only because the entrance of carnivorous beasts has been barred by the protecting zone of water. Primitive forms have been allowed to persist, and degenerate forms have not been eliminated.

COUSINS OF OUR 'POSSUM

Like the eucalyptus of the plant world, marsupials have dominated the animal kingdom of Australia, and in their adjustment to a varied environment have evolved species very unlike in form and manner of life. In size they range from the giant kangaroo, the height of a man, to creatures no larger than mice, and extinct forms include diprotodon as large as a rhinoceros, kangaroos more than 10 feet high, and a huge carnivorous beast as big as a polar bear.

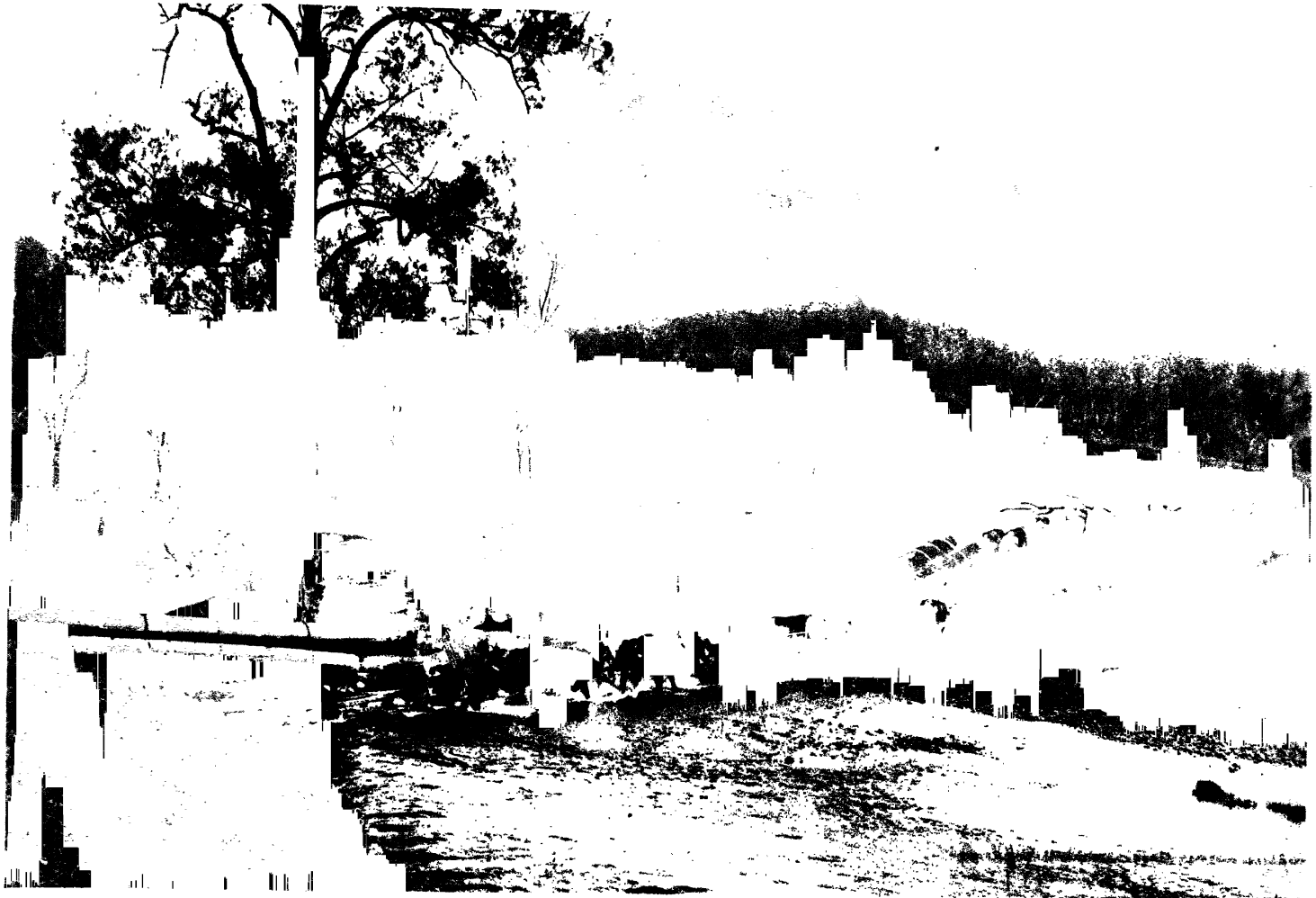
Some marsupials live in trees; others roam the woods or desert; still others burrow in the ground. Some species eat grass; others live on leaves. One large group is carnivorous, eating flesh or insects; another eats food of all kinds. Some are nocturnal; others seek their food by day.

AN ANIMAL WITH FIFTY-FOUR TEETH

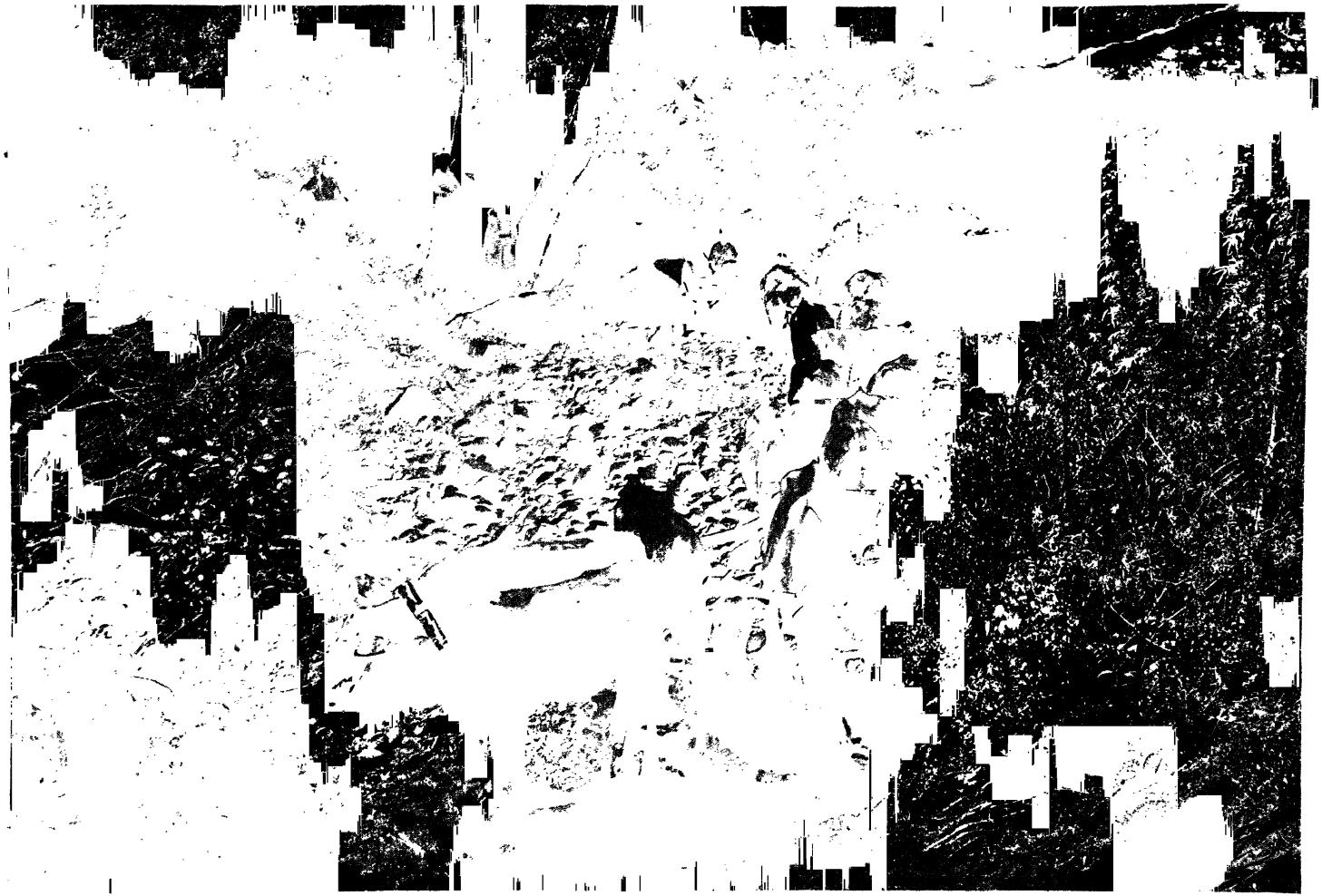
The Tasmanian devil is a ferocious beast; other forms are harmless, and some are affectionate pets. One species is blind; another has toes like the deer. Some have few teeth, but the striped ant-eater has fifty-four, the greatest number in any living land mammal.

The great diversity of species is reflected by the popular names—tiger, native cat, weasel, mole, rat, mouse, wolf, bear, flying squirrel, opossum, ant-eater, in addition to the terms kangaroo, wallaby, wombat, bandicoot, obtained from the aborigines; but all are marsupials.

The kangaroos and the closely related



HAULING TIMBER TO MILLS: LAMINGTON, BEAUDESERT DISTRICT



Photograph from Lieut. W. K. Harris

A TIMBER-GETTER AND HIS FAMILY IN THE "BIG SCRUB," NORTH COAST DISTRICT OF NEW SOUTH WALES



Photograph by Beattie

A EUCALYPTUS LOG FROM TASMANIA

A great many of these logs are sawed up into paving blocks and exported to the ends of the earth (see page 405)

wallabies are the commonest of the larger Australian mammals. They play the rôle of the American buffalo, formerly feeding by thousands on the grass-covered plains, but are now disappearing under the attack of the sportsman and fur merchant. In earlier days they formed the chief item of food for the native "blackfellows" and for the pioneers. They are generally harmless and shy, and when approached the females hastily gather their young into their pouches and retreat to shelter by a series of enormous hops at a rate exceeding 15 miles an hour. When attacked at close quarters they defend themselves vigorously.

An "old man" kangaroo standing on his hind legs and tail, with his head as high as that of a man, is no mean antagonist. He boxes skillfully, and with his powerful hind leg and claw can rip up a dog at a single stroke. When streams or lakes are handy he seizes a dog, or even a man, and holds him beneath the water until life is extinct.

The "native bear," or koala, belies his name except in form. He is a lethargic, unintelligent, fluffy little creature, an attractive though unresponsive pet. In the night-time he feeds on the leaves of the gum trees; during the day he usually sleeps curled up in the fork of a branch. The young spend their time in their mother's pouch or hanging to the fur on her back. The wombat plays the part of the woodchuck; the bandicoot is the rat, and the Tasmanian wolf the wild cat, of the marsupial family. The most numerous group of marsupials, like their namesakes, the 'possum of the South, hide away in daytime in hollow logs or trees, or hold themselves on branches with their long, prehensile tails, coming out after dark to feed on leaves or fruit. Their fur is in great demand.

A HUNDRED KINDS OF SNAKES!

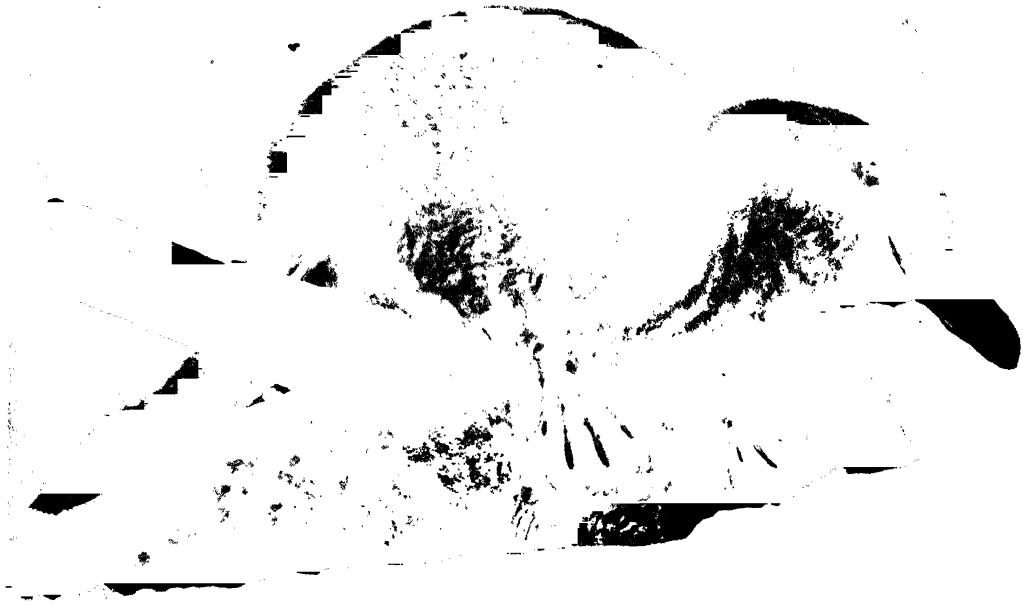
Australia is supplied with 100 species of snakes, three-fourths of them venomous. The big pythons and rock-snakes are harmless, but as one travels from the tropics southward the dangerous varieties increase in number, and in Tasmania all are venomous, though only five are really deadly, and fortunately these are rarely seen.

The continent is also abundantly supplied with lizards. Three hundred and



FOREST OF EUCALYPTUS (MANNA GUM): NOTE THE THREE MEN

"To me the most lasting impressions of Australia are of its wonderful woods. One readily understands why the Australian loves his trees. The groves of giant eucalyptus form pictures never forgotten, and the scent of the wattle brings a homesick feeling like the smell of the sage to a Westerner" (see text, page 486).



Photograph of specimen in U. S. National Museum

AN ANIMAL THAT LAYS EGGS LIKE A TURTLE AND SUCKLES ITS YOUNG: THE PLATYPUS OF AUSTRALIA

This is a web-footed, beaver-tailed, duck-billed creature which inhabits the river banks of Australia and Tasmania. When it was first described the scientific world thought the naturalist who reported it a nature faker. Even when a stuffed specimen was sent to England there were those who believed it a "fabrication out of the whole skin." It has teeth with which to chew its food, but it lacks an external ear, although its hearing is most acute.

ninety species are recorded, and they may be seen not only in woods and prairies and deserts, in the water, among rocks, and in trees, but also in the less frequented city streets. The monitors, or "iguanas," attain lengths exceeding 6 feet. Their favorite food is young birds and eggs, which they secure by climbing trees corkscrew fashion or robbing poultry yards. Skinks are the most abundant lizards and form an interesting series in which limbs become gradually shorter and toes gradually disappear until "the fore limbs have vanished and the hinder are reduced to rudiments with a solitary toe."

The strangest of all lizards are the legless one, one family of which is found only in Australia. They look and move like snakes, for which they are often mistaken. One of the forms (*Pygopus lepidopus*), locally called the slow-worm, is about 2 feet in length, and so exceedingly brittle that it snaps into several pieces when grasped back of the head. Some of the lizards in the deserts exhibit bizarre forms and are as beautifully colored and as harmless as their namesakes of the Colorado plateaus.

WAS AUSTRALIA EVER CONNECTED WITH SOUTH AMERICA?

The lizards, also most of the flying birds, crayfish, and insects, have their nearest allies in the Malay Islands to the north, and indicate a former land connection through the Pacific islands to Asia. The animals of more ancient lineage, like the marsupials, the air-breathing fish, and the giant earthworms, have their nearest living relatives in South America, and suggest that at some time far back in the history of the world the thousands of



A KANGAROO OF NEW SOUTH WALES

"An 'old man' kangaroo standing on his hind legs and tail, with his head as high as that of a man, is no mean antagonist. He boxes skillfully, and with his powerful hind leg and claw can rip up a dog at a single stroke. When streams or lakes are handy, he seizes a dog, or even a man, and holds him beneath the water until life is extinct" (see text, page 500).

Australia may be said to be a museum in which animals that became extinct in other parts of the world ages ago still persist in a modified form. The kangaroo is a representative of the general type—the marsupial. And of the kangaroos there are many species, from the big grays and reds, the size of a man, to creatures no larger than mice (see page 407).



Photograph by B. W. Kilburn

THE PET KANGAROO AND HIS TRAINER: AUSTRALIA (SEE PAGE 497)

Many circuses have boxing kangaroos. In nature, the kangaroo, when attacked and a line of retreat is not open, usually backs up against a tree and defends itself with its fore feet. Trainers turn this method of defense to their advantage by putting boxing-gloves on the kangaroo's fore feet, and then training him in the manly art of self-defense; and the boxer who can break through a kangaroo's guard is a good one.

miles of sea now separating that continent from Australia were crossed by a bridge of land.

The lover of insects finds Australia an interesting and but partially explored field. Spiders, butterflies, beetles, moths, wasps, bees, cicadæ, are abundant, widely-distributed, and include many forms of great beauty and unusual habit. Some of them are unique. The number of bush flies which occur in summer is incredible. In the arid regions it is impossible to eat with even a semblance of comfort between sunrise and sunset, and traveling without the protection of a head-net is possible only for the skin-hardened bushman.

Of the neuroptera, the best-known and best-hated species is the white ant—a termite of unusual destructive ability. He flourishes in deserts, in woods, and makes his way into city buildings. Supports of houses must be protected by caps of iron, for few timbers are immune from his attack. If printed accounts are to be believed, lead boxes and pipes are not beyond the range of his voracious appetite. The mounds built by the white ants are odd-looking structures, firm as soft wood and of various shapes. Mounds like miniature haystacks scattered through the woodlands or as thickly set as trees in a forest are familiar sights in parts of the continent. Shaft-like nests resembling decayed stumps attain heights of 6 to 10 feet (see page 505).

A LAND OF BEAUTIFUL BIRDS

Australia is stocked with beautiful birds, many of them of unusual aspect. The man who originated the popular saying that "Australian birds have plumage, but no song," must have lived in a sound-proof box. Among the 775 species are included some of the most brilliantly colored, sweetest voiced, and most unusual birds in the world.

Along the northeast coast is the bower



THESE QUEER ROCKS ARE NESTS BUILT BY THE WHITE ANTS (SEE PAGE 504)

bird, which adorns its nest and decorates its playing ground with shells, seeds, and other bright objects, not despising brass buttons and cartridge cases (page 507).

The lyre bird, famous for its plumage, is the rival of the mocking-bird of the South in sweetness of tone and skill as a mimic. The crow-shrikes ("magpies"), the brown flycatcher ("Jacky Winter"), the bush warbler, the rock warbler, the reed warbler, the bush lark, the cuckoos, the honey eaters, and the "Willy-Wagtail" constitute parts of a bird chorus difficult to surpass. Cockatoos are as common in Australia as crows in the Central West; even in the desert flocks were frequently seen. Some of them are excellent talkers, most of them gorgeously dressed.

A most surprising bird is the kookooburra, or laughing jackass. All at once in the quiet bush come loud peals of uproarious, mocking laughter. One is not inclined to join in the merriment—it all seems as foolish and weird as if an idiot boy were disturbing a congregation in church. When the source of the laughter is located, it turns out to be a silly-looking bird with clumsy, square body and open mouth sitting unconcernedly on a stump. Some animals look so foolish, say and do such silly things, and yet are so patient and friendly that affection involuntarily goes out to them. The kookooburra is one of these and the bird which mocked me at Mt. Gambier, and the solemn little fellow which toddled about the yard of my hostess at Melbourne will long remain in memory (see page 506).

A BIRD-BUILT INCUBATOR

The ibis occur by thousands, and the gigantic black-necked stork, or jabiru, standing 5 feet high, inhabits the swamps of the northern coast, while the graceful black swan frequents the estuaries and lakes. The mallee hen and the brush turkey build mounds of sticks, leaves, and earth 3 to 10 feet high. The eggs are laid in burrows excavated in the mound and are left to be hatched by the heat resulting from decomposing vegetable matter—a home-made community incubator.

The cassowary of the forests of Queensland and Papua and the emu, which is found throughout the continent, are unknown outside the Australian region. The emu is the national bird and shares with the kangaroo the task of upholding the shield on the commonwealth coat of arms. It is a powerful bird, can



Photograph from Boston Photo News Co.

THE LAUGHING JACKASS (SEE PAGE 505)

run at the rate of 15 to 20 miles an hour, and break an ordinary fence by impact.

The ostrich has been introduced into South Australia and the export of its plumes bids fair to assume considerable proportions. Stray ostriches are occasionally met with. On a smooth stretch of desert road north of Port Augusta we had an opportunity to gauge their speed. It was a neck and neck race for 2 miles, with the motor cyclometer registering 30 miles an hour.

THE ORIGINAL AUSTRALIANS

The isolation of the Australian Continent, so clearly reflected in its fauna and flora, has left its stamp on the native race. Like the kangaroo and the tree fern, the aboriginal is a remnant of bygone days. Paleolithic man, whose primitive tools are eagerly sought in the caves and gravels of Europe, was alive in Tasmania within the memory of people now living, and Neolithic man is roaming the deserts of Australia by hundreds.

Though comparatively little is known of the aborigines and many tribes have never been studied, there is general agreement that the "blackfellow" is on the lowest rung and perhaps at the very bottom of the ladder of civilization. In the opinion of Andrew Lang, "they are infinitely beneath the status in culture of Paleolithic man of the mammoth and reindeer period," and their "manners and rites were far the most archaic of all with which we are acquainted."

The Australian native* is unlike the

*The term "native" is used in the American sense. In Australia the term is applied to native-born whites. The original inhabitants are "blackfellows" or aborigines.



From "Birds of Australia," by John Gould

A BIRD THAT BUILDS A PLAYHOUSE AND GARDEN—THE AUSTRALIAN BOWER BIRD

There are several species of bower birds, chief among them the Satin and the Newton. The Satin bower bird is the best known. When the bowers were first discovered it was supposed that they were playhouses built by the native children; but, as a matter of fact, they are the dance halls of bird land. The nests are built in the trees and have no connection with the playhouses. The male birds build these latter and gather every bright and shining object they can find to adorn the entrance to the bower. When it is completed, according to one who has watched them, little "at homes" are given daily, at which the males meet and pay their court to their lady loves, now bowing and scraping, now playing hide and seek through the bower, and now doing an absurdly dignified dance for their edification. Newton's bower bird decorates its bower with fresh flowers every day, and if a visiting male bird wants a fight all he has to do is to disturb one of these flowers. The master of the bower proceeds with the painful duty of teaching him how to behave in company, while the remainder of the party raise a great racket, but never interfere. A naturalist studying them disarranged one of their flowers, but each time he did it the bower master rearranged it with great care.

negro, the Malay, the Mongolian, and the American Indian in physique and facial expression. His range in height is about that of Europeans. Some individuals are strongly built, but in general only the upper part of the body is well developed. The legs are usually thin and long, with inconspicuous calves, the great toe is "loose," and the foot is about as useful as the small, delicately formed hands in picking up objects. A long skull, with a low, flat forehead and brows overhanging deep-set, intelligent eyes, a heavy lower jaw, strong teeth, and a nose broad and very flat, with wide nostrils, are conspicuous features. His cranial capacity is 75, as compared with 83 for the African negro. Wavy or curly hair, not woolly or frizzy, of auburn or black tones, is abundant not only on the head and face, but in some cases covers the body, and many new-born children are coated with long downy hair.

LITTLE USE FOR CLOTHING

With the arts the native is little acquainted. He has no permanent buildings. His shelter is a cave or overhanging rock, sometimes a piece of bark to ward off rain or branches to shield him-



Photograph from Boston Photo News Co.

THE NATIONAL BIRD—THE EMU

The emu is a bird that has relied on its legs for so long and used its wings so little that it now cannot fly if it wants to, its wings having degenerated into mere rudimentary members. It fights only in self-defense, but it can kick sidewise as well as backward, sometimes with force enough to break a man's leg. Papa Emu is an amiable person, taking most of the cares of the household off the shoulders of his mate. The ostrich has plumes and only two toes, while the emu's feathers almost resemble hair, and it has three toes (see page 505).

self from the sun. He does not bother with clothes except when the weather is particularly bad, and then bark or the skin of the kangaroo is used without sewing or fashioning. Some tribes use rushes and seaweed for temporary clothing or make a blanket from the dried scum of lakes. For boats pieces of bark tied at the end and daubed with clay suffice.

He makes no pottery, and cooking utensils are represented by stones for crushing roots and seeds, stone knives, and a rudely fashioned scoop which serves as a dish, a spade, and as a receptacle for carrying water. He knows nothing of agriculture, and his one domesticated animal is the dingo, a half-wild dog.

The geography of Australia is such that localities where food and water are sufficient for a large number of people are very scarce. There are no wild cereals, and the native fruits are few in number, restricted in distribution and of meager nutriment, while water must be searched for over half the continent. The different tribes therefore have no fixed abode beyond vaguely defined limits inside of which they roam in search of food like packs of hunting animals. The groups are necessarily small and their relations are governed by fear and suspicion. Infrequent contact has resulted in the development of many languages within the same race. In "one district less than 300 miles square seven languages are spoken, one of them in two dialects, one in five."

MOST EXPERT OF HUNTERS

In endurance and speed he is not the equal of the American Indian, and his weapons of wood and poorly fashioned stones are effective only at short range; but as a hunter the native Australian is marvelously adjusted to his environment.



Photograph by B. W. Kilburn

THE HAPPY NATIVE KANGAROO HUNTERS: QUEENSLAND

His success lies in an intimate knowledge of the habits of animals on land, in the ground, in trees, and under water, and his wonderfully developed powers of observation.

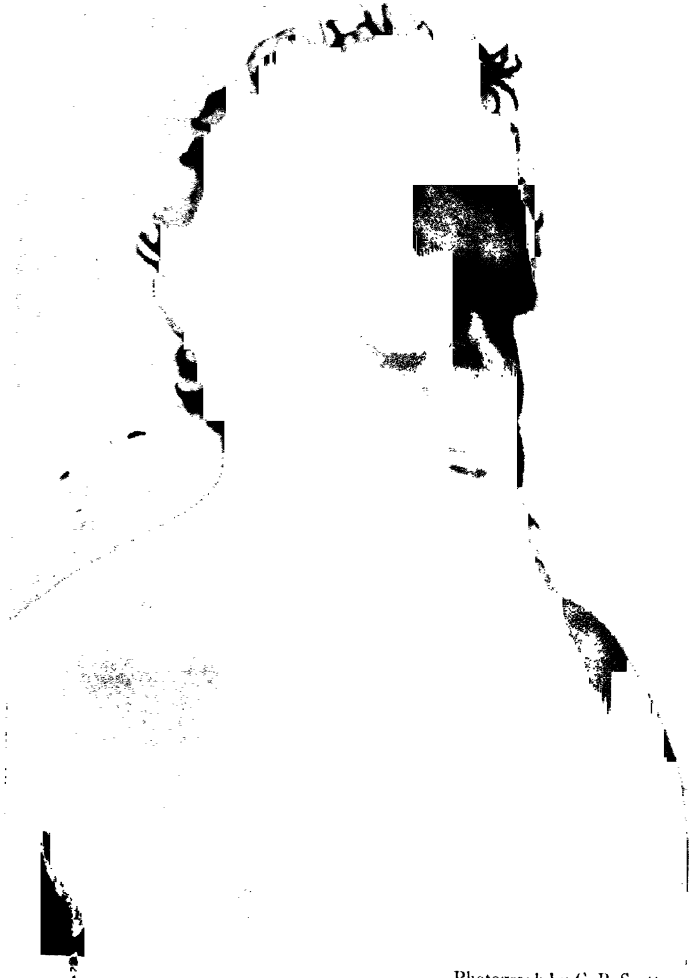
He decoys pelicans by imitating their cries, catches ducks by diving below them, locates an opossum in a tree by marks on the bark or by the flight of mosquitoes, finds snakes by observing the action of birds, and follows a bee to its store of honey. Any animal which leaves a track, however dim, in sand, on rock, or in the grass, falls an easy prey to the blackfellow. Children are taught to track lizards and snakes over bare rocks and to find their absent mother by following tracks too indistinct to serve as a guide for an European. When a white man is lost in the desert or a child strays from home, the final resort is to secure a "black tracker."

When in search of game or enemies, the native is armed with a stone hatchet, a boomerang, and a stout club, all stuck in a belt made of cords spun from hair or fur, and with a sheaf of selected spears and a throwing stick carried in the hand. The spear is the principal weapon—long ones armed with stone or barbed wood for war and shorter ones of reeds tipped with hard wood, or still shorter-pointed sticks for hunting. The effective range of the spear is greatly increased by the use of a wommera or spear-thrower.

THE INVENTOR OF THE BOOMERANG

Clubs of all sorts are hurled at prey or human enemies. The best-known form is the boomerang, made of a curved piece of heavy wood about 2 feet long and 2 inches wide. The well-known return boomerang, round on one side, flat on the other, and slightly twisted on its axis, is used as a plaything or to hurl at flocks of birds in the sky. The war and hunting boomerangs are heavier; they do not return to the thrower, but are deadly weapons at ranges inside of about 400 feet.

Faced with starvation, the native knows



Photograph by C. P. Scott



Photograph from H. E. Gregory

SOUTH AUSTRALIAN BLACKFELLOWS: THESE SAVAGES RANK LOWEST IN INTELLIGENCE OF ALL HUMAN BEINGS

nothing of property rights; food is to be obtained wherever found, either in the open or in possession of his fellows or of the immigrants. When his hunger is satisfied the next strongest man may have the remains.

The kangaroo, wallaby, and opossum form his chief food supplies; but no animal or nourishing plant is neglected. The diet of the north Queensland aborigines includes 240 plants and 93 species of mollusks. Ants, caterpillars, moths, beetles, and grubs of all sorts are eaten raw or cooked. Honey, birds' eggs, and young birds are obtained from trees by use of a climbing rope or by cutting notches with his stone hatchet. The native is fond of snakes and lizards, which are cooked on hot stones covered with leaves and earth.

Human flesh is not a regular article of diet, but when conditions are hard men who have fallen in battle or died of disease are added to the food supply, and infants are killed and sometimes eaten by their parents. Captives are commonly slaughtered and eaten, sometimes for ceremonial purposes, sometimes to satisfy hunger. The flesh of the native or Chinese or Malay, whose diet is vegetable, is said to be preferred to that of Europeans, which is tougher and more salt.

The blackfellow is not a "degraded savage," but rather a primitive man placed in an unfavorable environment. When food and water are abundant the aboriginal is kind to the infirm, and even shows traits of generosity and gratitude. When the struggle for existence is severe he becomes an animal searching for its prey. Mentally he is a weak child, with uncontrolled feelings, without initiative or sense of responsibility. In many respects he is intelligent and profits by education, but abstract ideas are apparently beyond his reach. His ignorance, suspicion, and fear, rather than viciousness and evil intentions, make him dangerous to strangers.

The story of the relations between aborigines and whites of Australia repeats a chapter in American history. Organized brutal treatment in Victoria practically ended with the Myall Creek massacre, in 1839, during which thirty or forty men, women, and children were murdered by the whites. The Queensland natives suffered unbelievable cruelties at the hands of the white settlers as late as 1860-1870, and not until 1897 did West Australia undertake their protection. In Tasmania a great hunting bee, in which 3,000 Europeans of all classes took part, was organized in 1830 to exterminate the native race. From the slaughter about 200 were rescued and placed within a reservation; by 1847 only 44 natives remained. In 1876 Truganini died and the Tasmanian race became extinct.

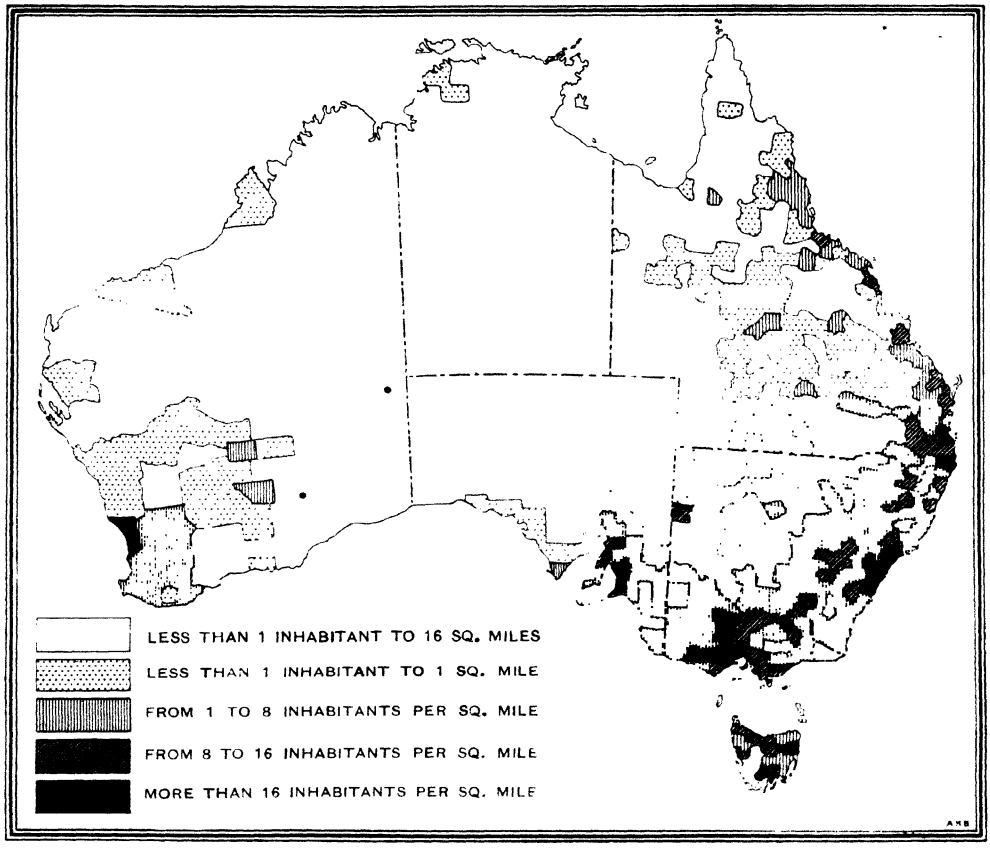
The natives on the mainland are now under the protection of the government, but "the birth rate has dropped amazingly" and it is doubtful if any large number can survive the process of civilization.

OUR PRIMITIVE ANCESTORS

The origin and migration of the Australian native stock is a fascinating story, whose outlines and chapter headings only have been written. The Tasmanians were perhaps a separate group related to the Papuans. Unlike the native of the mainland, their hair was coarse, short, woolly; they had no boomerang, no wommera, knew nothing of polished stone implements, and their boats were rafts made of reeds.

It is probable that this race reached Tasmania before the Glacial Period, when its island home formed part of the continent. The great antiquity of the race on the mainland is demonstrated directly by the discovery of stone hatchets buried in peat beneath extensive deposits of marine clays 15 feet below sea-level, and no less conclusively by the great development of languages and dialects and the absence among the tribes of traditions of migration.

A feature of peculiar interest is the almost universally accepted conclusion that the aboriginal stock of Australia belongs to the Indo-Aryan or Caucasian race. Their nearest relatives are the Veddahs of Ceylon and the Dravidian races of the Deccan plateau. Although perhaps the most primitive of the world's inhabitants, tucked away on an extremity of the world's lands and isolated for a whole geological period, they are our own



A MAP TO SHOW THE DISTRIBUTION OF THE POPULATION

racial relatives and picture the life of our ancestors.

MOST OF THE PEOPLE LIVE ON THE SEACOAST

Australia is the size of the United States; its density of population is less than that of Arizona (1.07 persons to the square mile). The continent is less thickly populated than Russia in Asia, or the similarly situated Canadian plains, and has less people to a square mile than South Africa, Algeria, or even Arabia. All of the States are thinly settled.

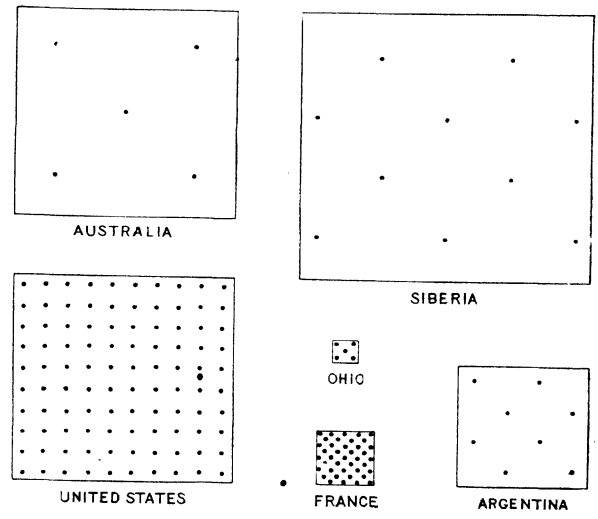
Victoria, the most densely populated State, is about equal in size to Kansas plus Connecticut and Rhode Island; its population is about that of Connecticut. New South Wales, much larger in area than Texas, has the population of Arkansas. Queensland, inside of which could be placed the seventeen Atlantic States, extending from the Gulf of Mexico to Quebec, in addition to Minnesota, North Dakota, South Dakota, and half of Iowa, enrolls less people than Oregon. South Australia, larger than the three Pacific States, California, Oregon, and Washington, plus Kentucky and West Virginia, has the population of New Hampshire.

The enormous State of West Australia, within whose borders Spain, Italy, France, Belgium, Germany, and Austria-Hungary, or all the United States east of the Mississippi, could be accommodated, has 40,000 fewer people than rural Vermont. In density it corresponds with Greenland and French Sahara. Tasmania, the baby State, is a little larger than West Virginia; its population is about that of Columbus, Ohio. The Northern Territory, ten times the size of Alabama, is inhabited by 3[illegible] people—the sparsest population of any consider-

able area of the earth's surface inhabited by man.

A modern warship, if allowed access to the bays and harbors, could bring about one-half the population within reach of its guns. A belt of country 100 miles wide along the east, south, and southwest edges of the continent would include probably 80 per cent of the Commonwealth population. There are no inland cities of over 10,000 population, except six mining camps, and the most remote of these is about as far from the sea as is Pittsburgh.

In the center of the continent is an area larger than all the United States west of the longitude of Denver, in which less than 5,000 people reside.



A COMPARISON OF THE DENSITY OF POPULATION OF AUSTRALIA, THE UNITED STATES, SIBERIA, FRANCE, AND ARGENTINA

The squares represent the relative areas of several countries and the dots the population, there being a dot for each 1,000,000 inhabitants. If small squares are formed by connecting the dots, the relative sizes of these will represent the relative amount of land per inhabitant.

CITY LIFE EVEN MORE POPULAR THAN IN THE UNITED STATES

A striking feature of the Australian census is the concentration of population in cities—a phenomenal situation for an agricultural and pastoral nation with less than 1 per cent of its area under cultivation and 47 per cent unoccupied. The six Australian State capitals include 38.80 per cent of the Commonwealth's population, and five of them are growing at the expense of the back country. No other nation, and few States, can match these figures. In South Australia 45.08 per cent of the people live in Adelaide; Perth enrolls 37.95 per cent of the people of West Australia; a large part of the remainder are in mining camps. Sydney, the capital of New South Wales, has 725,000 inhabitants, 39.6 per cent of the entire population of the State, and 71 per cent of the increase for the period 1911-1913 is credited to the metropolis.

Victoria shows an even more marked tendency toward urban concentration. The proportion of the population of Melbourne to the total population of the State has steadily increased from 43.3 per cent in 1909 to 47.1 per cent in 1914, and there seems no prospect of a diminution. During the three-year period ending 1913, 84 per cent of the increased population was credited to Great Melbourne, which is growing three times as fast as the remainder of the State. During 1914 a net loss was recorded for the population outside of the metropolis.

It has interested me to compare the distribution of the first 5,000,000 people within the United States—a number reached about 190 years after the first English settlement—with the distribution of Australia's first 5,000,000, attained in 1915—127 years after the landing at Botany Bay. In both cases the people were grouped on the edge of the continent, in corresponding positions, their centers of settlement determined by climate and soil and nature of the coast. The chief point of difference is the absence of large cities in the United States. In 1800 New York was one-ninth the size of Sydney, and the entire urban population of the United States (4 per cent of the total population) could be accommodated in the city of Adelaide.

WHITE AUSTRALIA

A "white Australia" is the settled policy of the Commonwealth government,



Photograph by B. W. Kilburn

A SCHOOL IN THE BUSH: QUEENSLAND

the immigration laws being so administered as effectually to exclude colored races. Legislation is directed particularly to the exclusion of Chinese, Japanese, and Polynesian labor, not only from the land, but from employment in pearl fishing, coastwise shipping, and on overseas steamers holding mail contracts. The various restrictive acts have secured the desired result. At the latest census (1911) there were 38,680 Asiatics, 693 Africans, 84 Americans, 2,751 Polynesians, 10,113 mixed-blood Australian aboriginals — a total of 52,338, including 14,554 half-cast, out of a population of 4,568,707, or a little more than one per cent.

The Australian's ideal is a continent of whites without the "taint of color," a homogeneous people of British origin." They point to America as a horrible example of an unmanageable mixture of races. They recognize the fact that their policy will indefinitely delay the development of the continent, but are willing to make the sacrifice.

But the fundamental reason of their policy is doubtless economic, an unwillingness to come into competition with "people with lower standards of living," to run the risk of disturbing the existing domination of the "laboring man." This attitude is shown by legislation against Asiatics already domiciled in Australia. By legal definition one Asiatic constitutes



Photograph by B. W. Kilburn

"A TOUCH OF NATURE MAKES THE WHOLE WORLD AKIN"

Children the world over are never so happy and interested as when they feel they are actually helping in some useful work. Australian youngsters are given every opportunity to help and they develop early a love of the practical things of life, which viewpoint generates energy, resourcefulness, and a love of the out of doors.

a factory, but four white people in three States and six in West Australia are allowed to work together without coming under the restrictions of the factory acts.

Australia is not only "white," it is also British—the most British of all lands outside of Great Britain. Australian writers call attention with pride to the fact that Canada has her French province, that the Dutch are in South Africa, that India and Egypt have large native elements, and that America is a medley of races. Of the total population at the last census 82.90 per cent were Australian born; 13.35 per cent were natives of the United Kingdom, and 0.72 per cent were born in New Zealand.

SOME NATIONAL TRAITS

They are proud of their British ancestry and glory in the achievements of their race.

An American who knows the United States and Canada feels at home in Australia, much more so than in the British Islands. He finds the people discussing immigration, land settlement, railroad building, mining, irrigation, forestry, secondary education, social legislation, progressive *vs.* stand-pat policies, military



Photograph from Janet M. Cummings

THE ROYAL ROAD TO KNOWLEDGE: YOUNG AUSTRALIANS OFF TO SCHOOL, VICTORIA, AUSTRALIA

O d Father Time steps aside for the moment to make way for Youth as he marches bravely along the one Highway to Knowledge that is available to Prince of the Blood and peasant lad alike—the school-room



© Underwood & Underwood

"DOING THEIR BIT"

Both well over their allotted threescore and ten, these two Australian women—the one on the right the mother of the commander-in-chief of Australia's oversea forces—are nevertheless contributing their share of assistance in maintaining their country's contingent at the front. They spend most of their waking hours cutting up clean rags to be used in pads for the wounded.

training, need of a big navy, and other matters relating to national development. He hears in general the language of Ontario, but the variation in individuals, families, and communities is closely similar to that in the United States, plus a bit of cockney.

Many of the numerous Australianisms are also Americanisms, but would require an interpreter in England. In some mining towns and outlying villages the local dialects of the United Kingdom are said to prevail, but there is probably nothing in Australia like Dunedin or Christchurch, New Zealand, where the peculiarities of speech of southern Scotland and middle England are found in an exaggerated form.

It seems to me that two things mark the Australian as a class from Americans—their attitude toward work and their attitude toward wealth. The percentage of men who do no productive labor, loafers and "idle rich," is probably about the same in the two countries, but the number of men and women who voluntarily work long hours and gladly assume uncongenial tasks with the idea of demonstrating their usefulness and "getting ahead" is very much greater in America. In Australia the species finds an uncongenial environment.

On the basis of doing a moderate amount of work amidst agreeable surroundings, most Australians are workers. Short hours are the rule, and there is a tendency to ward off competition by legislative enactments rather than to meet and overcome it.

The desire for money is in most cases a desire to secure a competence, not to secure power and prestige by amassing a huge bank account. Wealth is so diffused that nobody is really poor and few are



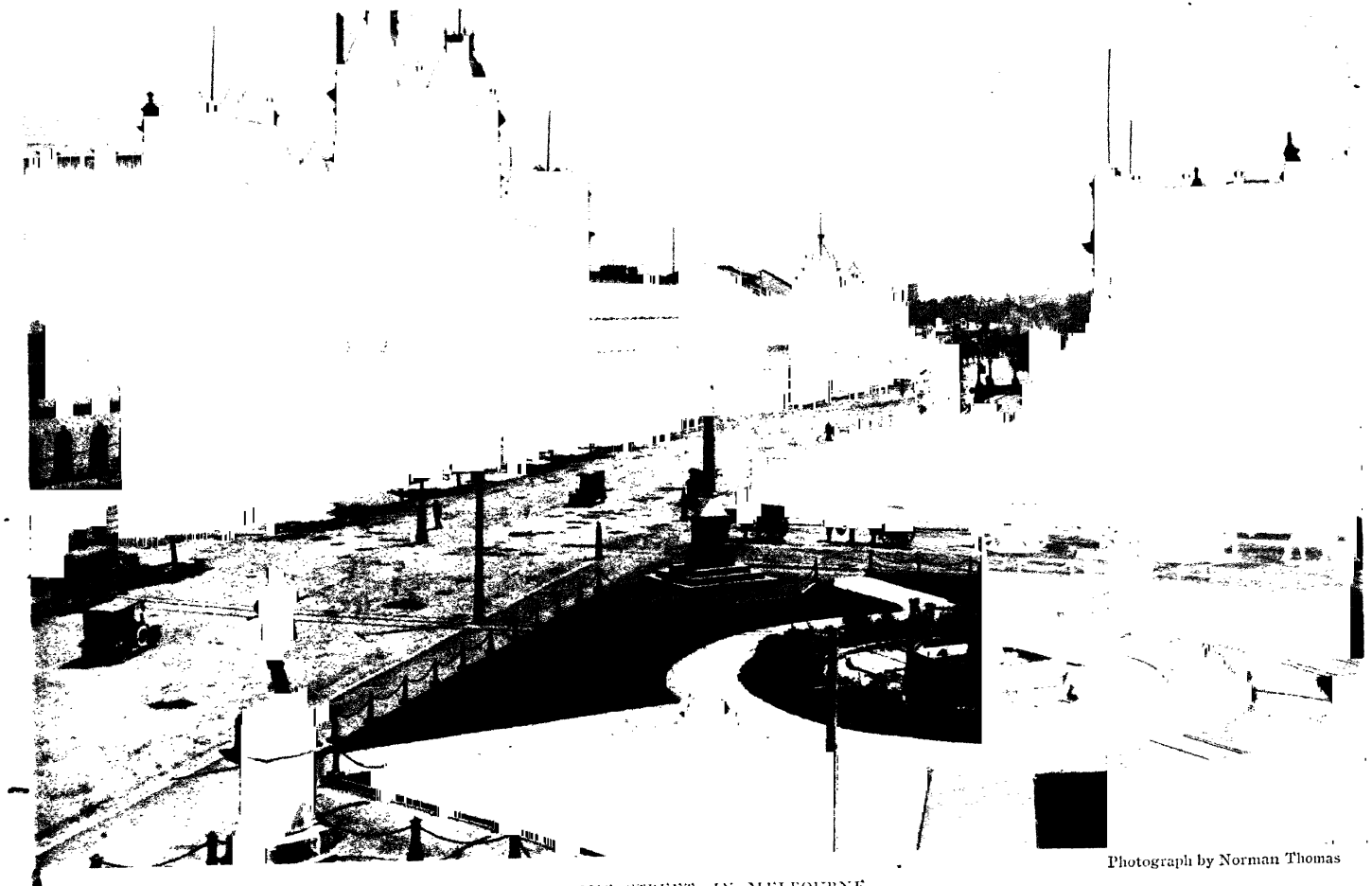
HOBART AND MOUNT WELLINGTON: TASMANIA

With Mount Wellington as a striking background and the Derwent River as its foreground, Hobart, the capital of Tasmania, is one of the most picturesquely situated cities of the southern world. Founded in 1804, it now has a population of 40,000 and is a highly progressive municipality.



COMMONWEALTH PARLIAMENT HOUSE: MELBOURNE, VICTORIA

While Sydney is much older than Melbourne, there is a neck-and-neck race between them for the honor of the greatest population, not to mention a gentlemanly rivalry in all other matters. More than one-fourth of the population of this continent is centered in these two cities. Combined they have about 1,400,000 people, while the population of the six Australian States is only about 5,000,000. At present Melbourne is the seat of the Federal Government, but will lose that distinction when the new capital, Canberra, is completed.



Photograph by Norman Thomas

SPRING STREET, IN MELBOURNE

Melbourne is the Chicago of Australia. Founded fourscore years ago, it now has nearly 700,000 population, and proudly claims to have finer public buildings than any other city of its size in any part of the world. The ramshackle districts which usually lie between the suburban places and the "down-town" section of a city are not found in Melbourne, which is practically slumless.

very rich. It is stated that one in six Australians owns property, and that one in four has deposits in savings banks.

HIGH SCHOOLS AND UNIVERSITIES POORLY ATTENDED

One of the anomalies of Australian life is their attitude toward education. In a country where the government digs a man's well, sells him fish, and tells him when to open his store, and where 98 per cent of the adult population can read and write, it is strange indeed that interest in higher education should be so slow in developing.

Free public education from kindergarten to a university degree, giving equal opportunities to rich and poor of both sexes, is not known in Australia. The numbers enrolled in secondary schools, both public and private, and in universities are therefore relatively small.

The States of Washington and Victoria have about the same population, but the Washington high schools enroll four times the number of pupils and the State University enrolls four times as many students.

One reason for the small number of students in the university and secondary schools is doubtless the tuition charges; but this obstruction is partly removed by scholarships and stipends of various sorts granted to deserving pupils at public expense.

To my mind the chief reason is the low valuation placed on higher education; too few are willing to obtain it at a personal sacrifice. Stories of American boys and girls without money, who by the thousands work their way through school and college by sacrificing their holidays and vacations, performing menial services and living on meager fare in cheap lodgings, read like fiction to the son of the Australian laborer.

AUSTRALIANS AT PLAY

With a short, easy day for the business and professional man and for the wage-earner, with Saturday afternoon free and frequent holidays, the Australian has the energy and the time for amusements, which, because of the climate, take largely the form of out-of-door sports. Horse-racing is a national interest, to an extent unknown in other countries, and race-courses are as much a part of a community's equipment as streets and cemeteries.

Metropolitan "cup days" in spring are the Easters of Australia, the days on which fashionable women display their new gowns and hats. For the great races people come to the cities by thousands, the streets are crowded, and the hotels packed to the limit. Ordinary work practically ceases; freedom and gaiety prevail and money is lavishly spent. The attitude of the community is like that of an American student during an intercollegiate foot-ball match.

Unfortunately horse-racing is not only the national sport; it is also the national vice. Where thousands see the races, tens of thousands bet on them. A lack of knowledge of horse or rider or owner is no deterrent, for there is little pretense of an honest race. The grand prize of $25,000 to $100,000—occasionally $300,000—is irresistible. The gambling spirit pervades all classes and all occupations.

To quote an attorney general of New South Wales: "Clerks and shop girls will stint themselves of food and office boys pilfer the stamps to buy a ticket or share in one of these lotteries . . . nine-tenths of the embezzlements and forgeries and breaches of trust which come before the Australian courts are directly due to horse-racing and its concomitants." In spite of editorial and pulpit utterances, of votes in the hands of women, of efforts of the Commonwealth government and mild legislation by States, the evil continues.

As in the United States, the "movies" often constitute the chief indoor amusement, but the universal recreation is the picnic, which in Australia reaches its highest development. Men, women, children, families, clubs, churches, lodges, and miscellaneous groups are out on picnics afternoons, Sundays and holidays.

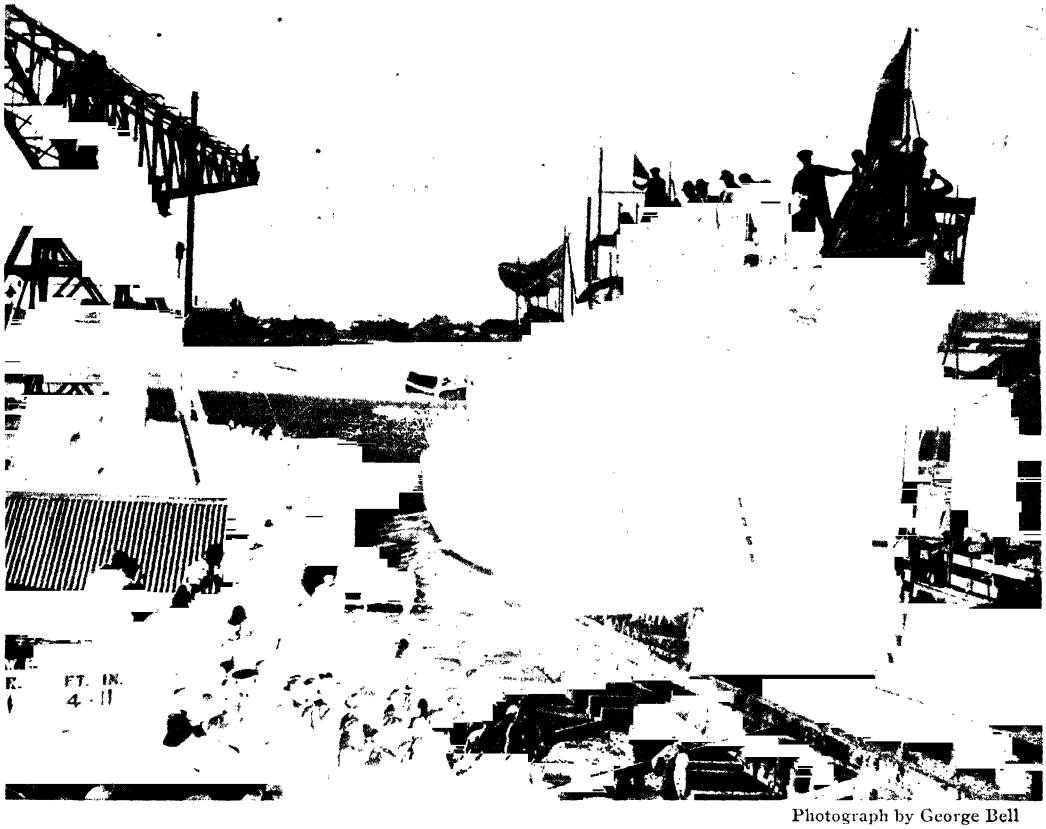
Two picnics a week are not unusual; a young lady of my acquaintance had five to her credit. The picnickers walk, ride horses, take wagons, or go by motor, street car, train, or boat. They go to the shore, to the woods, to rivers, to pictur-



Photograph by Norman Thomas

INTERIOR OF SYDNEY CITY HALL, WHICH HAS ONE OF THE LARGEST ORGANS IN THE WORLD

An Australian's idea of a nice day is the exact antithesis of ours. He thinks it is a nice day when it rains. When the havoc wrought by a drouth is realized, one cannot but agree that his point is well taken and his opinion justified. One wonders, though, if when the great city audience pictured above went into the street and found it raining "cats and dogs" a consensus of opinion among the ladies would have borne out the previous statement.



Photograph by George Bell

LAUNCHING THE AUSTRALIAN-BUILT TORPEDO-BOAT DESTROYER "TORRENS"

The policy of the Australian Commonwealth is to make the continent able to defend itself. Under an agreement with the mother country, it undertakes to equip and maintain a navy consisting of a battle cruiser, three unarmored cruisers, six torpedo-boat destroyers, and two submarines.

esque hillsides, or to the zoölogical and botanical gardens, which in Australian cities are used, not guarded by "keep off the grass" signs. The time is occupied by gossiping, reading, sewing, writing letters, playing simple games, eating lunch or supper, fishing, swimming, studying flowers or insects, or "plain resting."

America has much to learn from the Southern Continent of the use of parks and the attainment of recreation without the expense of country clubs and Coney Islands.

THE DAY LABORER IS KING

The day laborer, as opposed to the employer and to other workers, is king in Australia. The unions, through the labor party, practically control the executive, legislative, and judicial machinery of the cities, the States, and the Commonwealth. Much of the legislation enacted during the past ten years—for example, shortening of hours, increase in wages, restriction of child labor, safeguarding from accident, and employer's liability—finds its counterpart in the United States. Certain other features of industrial life are unfamiliar to Americans.

Forty-eight hours is the recognized maximum for a week's work; but in certain occupations forty-four, forty-two, forty, and even thirty-six hours are considered full time. Some of the larger building trades have a forty-four-hour week, and it is probable that this figure will become the recognized standard for all labor. Of the "four sacred eights" in the original slogan—"eight hours' work, eight hours' play, eight hours' rest, and



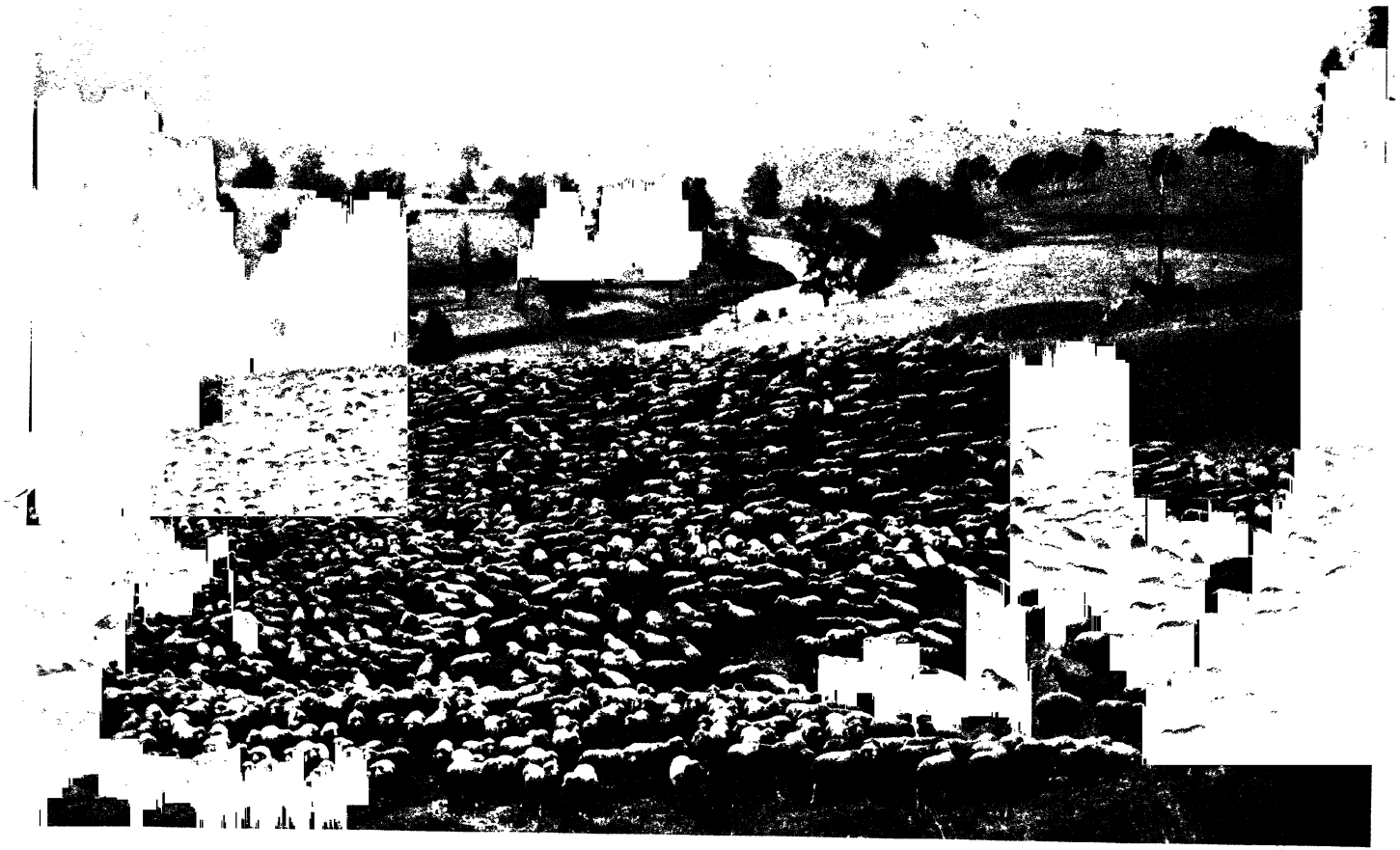
A BUSH PATH IN NEW SOUTH WALES

In the well-watered sections of Australia the vegetation is thick and tangled and the early settlers cleared their land with great difficulty



A BULLOCK-DRAWN LOGGING WAGON: NEW SOUTH WALES

They tell many a story about bullock drivers in Australia. Usually their language to the soldiering ox is about as sharp as the crack of their "black-snake" whips. But once a "bullocky," swinging his whip and preparing a whole machine-gun load of verbal shots to accompany its lash, perceived the mail-coach coming, and a clerical hat on the front seat. The whip dropped and the "bullocky" coughed politely, "Ahem, Strawberry, proceed." And to his obvious astonishment Strawberry did as he was told.



A FLOCK OF SHEEP ON A NEW SOUTH WALES RUN

Photograph by George Bell

*"The shearers are concentrating. For 100 miles on every side every one knows that shearing begins at the central paddock. Orders have to be sent out weeks before to the back stations to have different detachments of sheep marched into certain places on certain dates. Regiment after regiment has to be shifted in like troops at a military concentration. When the final order arrives to have the sheep from White Dog paddock in at Emu paddock on Wednesday week, at Emu paddock on Wednesday week they must be; for it may be that on that very day they will send from the station to fetch 5,000 or 6,000 of those sheep into the wool-shed paddock."—"On the Wool Track."



Photograph from Boston Photo News Co

PREPARING TO "DRAFT" A FLOCK OF SHEEP: NEW SOUTH WALES

Drafting sheep is the process of separating them. They are driven into the drafting yard, from which leads a runway wide enough for one sheep, with two pens at the end and a gate. By turning this gate to one side or the other the drafter is able to send a sheep into the one pen or the other. Each ewe has a right-ear mark and each wether has a left-ear mark. Expert drafters can work two and even three gates at a time, separating the sheep into three and even four pens and classes.

tracking. Some parts of the city are flat; in others the streets lead up and down steep little hills. There is no division into business and residential sections, or into "new part" and "old part," or "rich part" and "poor part." The soft buff-colored sandstone, so largely used in construction, gives a pleasing impression of age even to buildings recently constructed. It may be that the attractive informality of the life of the metropolis is a reflection of the city, or both may have resulted from the mild and fluctuating climate.

A KINDLY FATE

The surprising beauty and spaciousness of the harbor of Sydney, Port Jackson, its "deep water fingers stretching miles up between wooded banks," have often been described, but its commercial value is not so widely known. Fate never served an explorer a better turn than when it directed Captain Cook's course to the entrance of Sydney Bay, for it is the one place along a thousand miles of coast where access to the interior is easy.

In natural advantages it surpasses any harbor of the North American coast. The entrance is a channel one mile wide and 90 feet deep, walled by perpendicular cliffs of sandstone. Inside The Heads is an expanse of deep water covering several square miles and extending with slight decrease in depth along many miles of shore. Danger at the entrance, shifting sand-bars, shelving bottom, strong currents, and rough seas stirred up by winds are all lacking. In 1913 the total shipping business amounted to over 9,000,000 tons, a figure exceeded in the United Kingdom only by London, Liverpool,



SHEARING SHEEP: JIMBOW, WEST QUEENSLAND

A good shearer will shear one hundred sheep a day and is paid six cents a head. The shearing season begins in July and ends in November. Men come from all parts of the world to become shearers, and they travel from sheep station to sheep station as the tramp printer used to travel from city to city.

Cardiff, and the Tyne, and in the United States only by New York and Duluth.

Melbourne's appearance speaks of ambition and faith in the future and reflects the exciting epochs in the history of Victoria. The groups of government and city buildings are admirably placed and include some imposing structures which rank with those of any American State capital. Railways are convenient, the parks and public gardens are large and numerous, well cared for and largely used.

Business is concentrated on a relatively small number of blocks bounded by streets 99 feet wide, feeding into parkways of twice that width, which seem to have been planned to secure fascinating vistas. Although the exaggerated prophecies of Melbourne's builders have not become realities, the feeling for greatness, and order, and convenience has been splendidly expressed.

Adelaide's unusual plan—a business section surrounded by a zone of 2,000 acres of park lands, beyond which are the residential sections—seems designed to put business cares, recreation and quiet home life in separate compartments. The organization of city life to allow for



AN ILLUSTRATION OF THE HEAVY, FINE WOOL OF AN AUSTRALIAN MERINO RAM
(SEE PAGE 533)

leisure—a feeling more prevalent in Adelaide than in Melbourne, or even in Sydney, and almost unknown in American cities—is partly responsible for the universal impression among visitors that Adelaide ranks high in general culture.

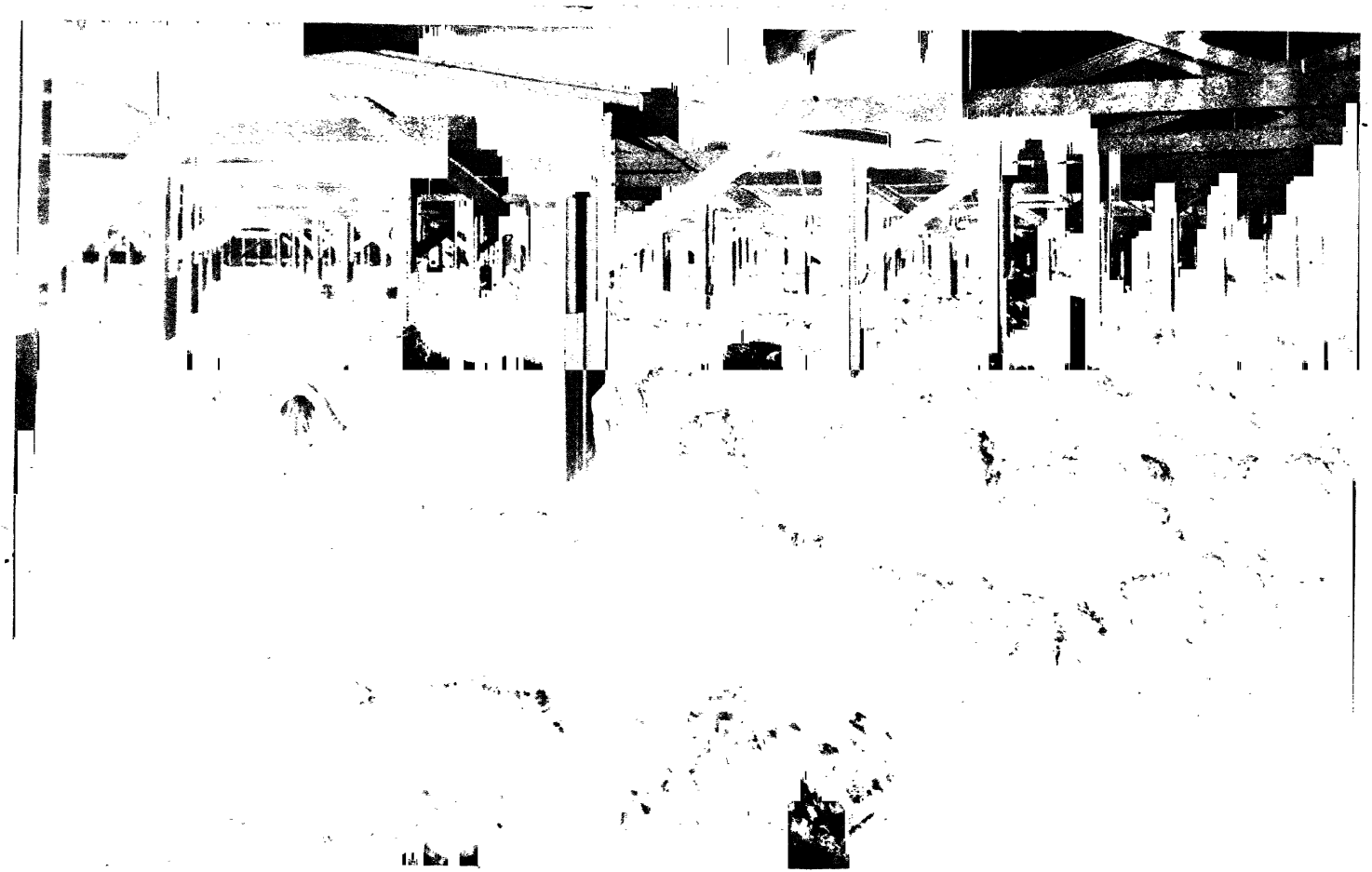
But climate and the high quality of the South Australian pioneers are also factors which have helped to make Adelaide such a desirable place of residence. Those who are attracted by the climate, people, and manner of life of the foothill cities of Southern California, who care for out-of-door life and flowers and fruit, and wish to spend week-ends in near-by mountains or at the seashore, would feel at home in Adelaide.

Most writers on Australia profess to see differences in types and manners in the three leading cities of the Commonwealth, and the natives feel sure that differences exist. Melbourne is "hustling;" Sydney is "easy-going"; Adelaide is "solid" and "contented." On the basis of short acquaintance these characterizations seem as unreal as "dead" Philadelphia or "provincial" Boston would to an Australian traveler. In the American sense, no Australian city is hustling; all are easy-going and contented; all are doing much business in an orderly, efficient manner. As places for residences, they have few competitors among cities of the United States.

THE AUSTRALIAN BUSH

The "bush" of Australia is the back country anywhere away from thickly settled communities, where life resembles that of the ranchman of New Mexico, the dry farmer of western Kansas, or the settler in a remote Colorado valley, whose daily round of duties involves energy, skill, and daring. The enemies of the bushman are not disagreeable persons who may be ignored or bought off or turned over to the police; they are heat and winds and floods—forces of nature to which man's resistance is feeble.

For the weak-hearted and the lover of



A WOOL SHED IN PORT ADELAIDE, SOUTH AUSTRALIA

The auctions of Australian wool markets often witness as lively bidding as on the New York Stock Exchange. The wool sold is contained in the big storehouses miles away. About a third of each lot is on the top floor, under bright skylights, each bale open, so that prospective buyers can inspect each lot before the sale begins and note on his catalogue the price he is willing to bid.

physical comfort and social companionship the battle with the bush is lost at the outset. The struggle demands self-confidence, a dogged refusal to be discouraged, a faith in the future of the country, and a profound belief that a man's life sacrificed for the good of coming generations is well spent.

A TYPICAL SHEEP STATION

Yalata, South Australia, is a typical sheep station of the better class. Parts of this ranch, which was formerly about the size of Connecticut, and still retains the generous proportions of 300,000 acres, are inclosed by dog-and-rabbit-proof fences and subdivided into grazing paddocks. The all-essential water is obtained from wells of uncertain yield, from storm-water "tanks," and from the roofs of buildings.

The ranch is a community in itself. There is a blacksmith shop, a carpenter shop, and a laundry, in addition to the familiar sheep pens and wool sheds. Besides the station-house—a roomy structure of stone and galvanized iron—there are outlying houses for workmen and huts for the families of "blackfellows"—docile dependents who are fed, cared for like children, and render a little inefficient service. Teams of camels bring in fuel and haul wool to the port at Fowler Bay (see map, pages 480-481) and pack-camels carry water to distant points.

There is not the bustle and long hours of labor common to American ranches, for the Australian employee has clearly defined working days. But the employer and his family are not restricted and their work is varied and arduous. The owner is incessantly busy with repairs, with examination of fences and water supplies, and keeps a cheerful and generous spirit in spite of the fact that hopes of financial independence, which had come within reach after years of isolation and struggle, were shattered by the drought of the previous year.

The women of the family, refined, educated and broadened by travel, are bearing the household burdens, running the store, post-office, and telegraph station, acting as nurse and medical adviser to women and children of the "blacks," and making life more endurable for the small ranchmen of the neighborhood, who had lost much through failure of crops and starvation of their meager flocks.

The ever-present temptation to "let things slide" is courageously resisted. Culture is shown in a collection of good books and musical instruments, in the appearance of the table, the leisurely ordering of meals, and the discarding from conversation of the cares of a busy day. Time is arranged for reading, for quiet gossip, and for interchange of ideas on a wide range of subjects. The dirt and annoyances incident to ranch life are kept outside of the home.

When a traveler comes along he is accepted on terms of equality, receives what the station has to offer, and is expected to give from his store of experiences. The bushman looking for work is passed along from station to station, hospitably entertained and supplied with provisions for the road.

For us hospitality was begun by the owner, who sent a cordial invitation 130 miles inland to our desert camp, and was ended by his daughter, who guided us on the 400-mile "track" to the boat at Port Lincoln.

THE LANDS OF COTTON AND WOOL

What America is for cotton, Australia is for wool. The Australian has no serious rival as a producer of Merino wool. In this favorable climate sheep multiply rapidly and produce the heaviest known fleece of the finest known quality. The fiber is fine, of great length, unusual strength, and therefore holds first place in the manufacture of high-grade cloths in England, Germany, and America.

With a satisfactory market assured for every pound of wool Australia can raise, it is natural to find all sorts of people trying their hand at sheep-raising. Lawyers, physicians, clerks, teachers, titled aristocracy, as well as farmers and stockmen, are enrolled as wool-raisers, and while the actual work on the run requires few men, the number indirectly connected with the wool and mutton business probably includes one-third of the population.

During a series of good seasons his returns are very great, but he must fight



Photograph by George Bell

CARTING WOOL TO BATHURST

The bullock teamsters charge about $20 a ton per hundred miles for hauling wool, the price depending largely on the supply of grass available along the road. Often the teams must cross vast parched plains several hundred miles broad, in which there is perhaps not more than one water-hole and one person to a hundred square miles (see page 535).

the dingo and rabbit, and a year of drought may mean complete loss of flocks. During the past ten years he has been called upon to give up his land to farmers and to pay the cost of political experiments designed to improve the lot of the day laborer in cities.

In 1913 there were 85,000,000 sheep in the Commonwealth; the value of wool exports alone was $128,000,000, or 65 per cent of the total pastoral products. In addition to wool, there was sent to market: mutton, $14,000,000; skins, $11,000,000, and tallow, $10,000,000; so that if all products of the sheep industry be combined, the total equals 40 per cent of all exports from the Commonwealth.

THE CATTLEMAN

As in America, the cattlemen of Australia occupy the outlying posts of civilization. They are "way out back" in the "Never-Never" country, or even "behind the beyond." The cattle roam widely over unfenced runs thousands of square miles in area. The average size of pastoral holdings in the Northern Territory is 275,000 acres. In West Australia one hundred people own together 40,000,000 acres, and Frazer speaks of a Queensland "cattle king" who held 60,000 square miles—an area nearly as large as all New England.

The events of the year are the "musters" (round-ups), when the "mobs" (herds) of cattle are assembled, counted, and sorted, the "clean skins" branded and suitable stock sent to market. But sending to market is a serious business. Two, three, or even five months may be required to drive cattle to the nearest port or railroad. Unless the season is favorable it cannot be done at all, for feed and water are lacking along the tracks. Even in good years forage is insufficient and water absent over long stretches of country, and herds of cattle started on the long drive may be greatly depleted by starvation and thirst, the remnant reaching their destination fit only for "boiling down."

A stockman told me of one of his mobs numbering 2,000 which succumbed completely to the hardships on an 800-mile drive (see also page 537).

STOCK ROUTES AND WATERING PLACES ARE MAINTAINED BY THE GOVERNMENT

Stock routes are laid out and tended as carefully as wagon roads or railways. They head for the principal markets, or for the ends of railroads, which extend into the arid belts and wind across the country, taking advantage of all known water supplies. Streams, springs, billabongs, and gnamma holes are used, regardless of the quality of the water, for almost any liquid is acceptable in the desert.

When the distances between watering places are too great, or areas of feed are beyond the reach of water, artificial supplies are provided and kept under surveillance. In places wells are dug; elsewhere reservoirs and tanks designed to collect storm water of infrequent rains are constructed. Many of these are built below the surface and covered to check evaporation. Where other means fail, skeleton buildings with large roof area are constructed to conserve rain-water.

A land-office map of an Australian State is decorated with a network of crooked lines, main arteries with branches, along which are indicated at distances of 10 to 40 miles the watering places and camping sites maintained by the government. These stock routes cover the continent like a system of railways, for which they form a substitute, and their construction and maintenance is a highly important function of the States.

In New South Wales 6,000,000 acres are reserved for this purpose, and seven hundred public watering places have been constructed, three-fourths of them tanks and reservoirs. In South Australia routes extend from Port Augusta to the borders of Queensland and West Australia, and into the heart of the Northwest desert for a distance of 700 miles. One route crosses the State and continues through the Northern Territory to the northern edge of the continent. West Australia likewise maintains 2,000 miles of stock routes leading from inland stations to the cities on the Southwest coast.

While farmers in the new country were few or absent, the cattlemen secured the land. They were powerful financially



STARTING THE PLOWING SEASON AT NARROMINE, NEW SOUTH WALES

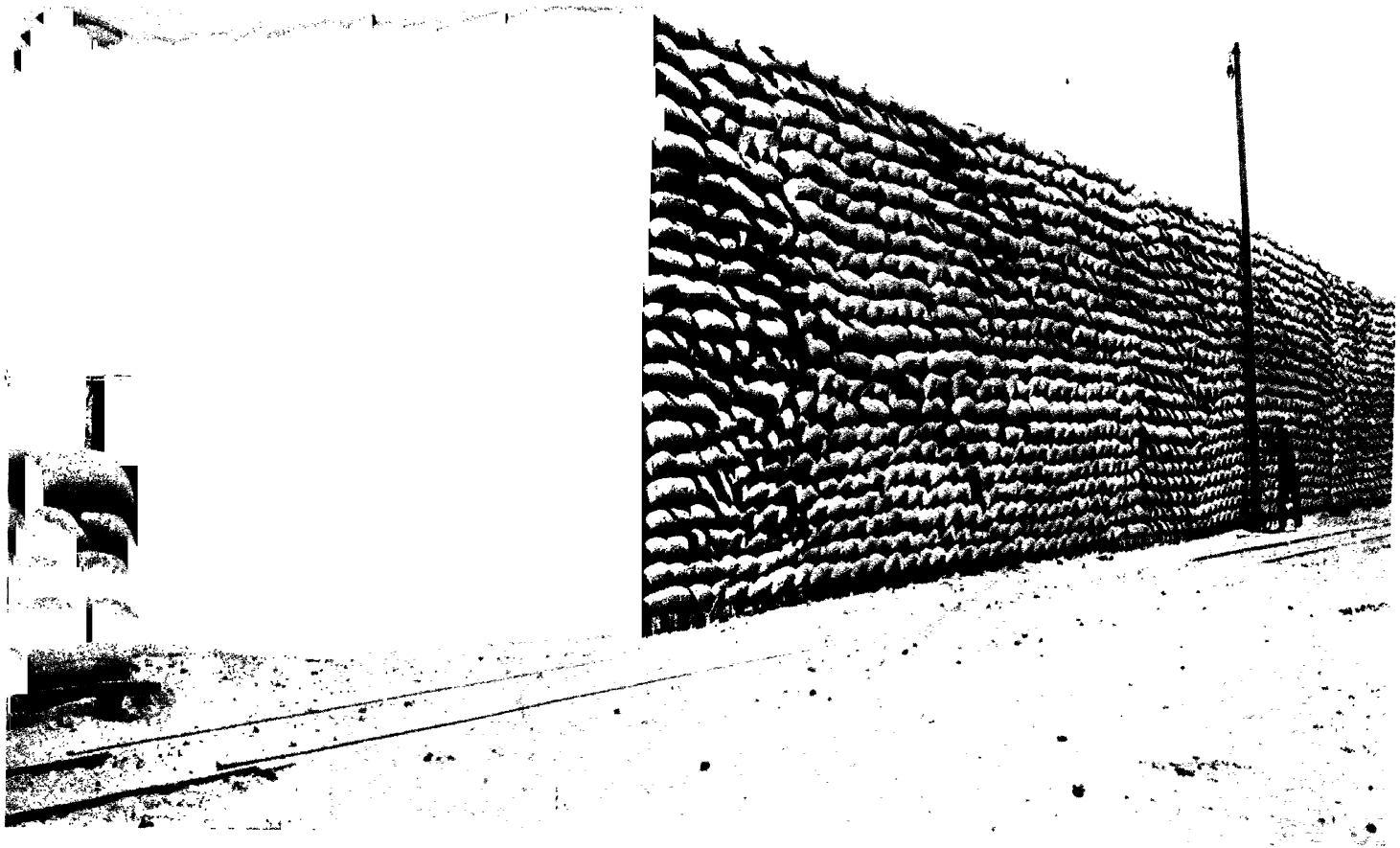
Australia is the most level in surface and regular in outline of all the continents, and even of most large islands. It is also the lowest continent, with an average elevation about that of Ohio.



Photograph from Janet M. Cummings

CARTING WHEAT IN THE MALLEE DISTRICT, NORTHERN VICTORIA

The Mallee district consists of about 11,000,000 acres of bush territory in temperate Victoria. It has a fair amount of rainfall, and when he scrub is cleared off makes excellent farming land. By a system of farm loans this can be carried out by settlers, the government lending a ixed amount for every ten acres cleared. Much wheat now grows where once the bush reigned supreme, although more than half of the district is till open to settlers.



200,000 BAGS OF WHEAT STORED FOR SHIPMENT: PORT WAKEFIELD, SOUTH AUSTRALIA

Owing to the dry weather in the harvest season, the wheat can be stacked for shipment. The wide separation of the points of origin preclude the use of elevators, and, unlike ours and the Canadian crops, it is mainly handled in bags (see page 537).

000 cattle from starvation and thirst. Mining operations were checked for lack of water. The wheat production fell in one year from 38,000,000 bushels to 12,000,000 bushels, and flour, as well as other foodstuffs, were imported. Many people left the country, the excess of departures over arrivals for the period 1901-1905 being 16,800. The birth rate decreased; the death rate increased so that the increase in population dropped to 1.38 per cent, the lowest in the history of the country.

Nothing shows better the temper of the Australians and the marvelous recuperative power of soil and stock than the rapid recovery from this overpowering disaster. During the drought "the black-soil plains of the Darling were reduced to dust, without vestiges of herbage for miles. Within a week they were covered with green, and in a few weeks there was luxurious pasturage."

In the year following the drought 74,000,000 bushels of wheat were harvested, and the fields of New South Wales, which had returned about two bushels to the acre in 1902, returned 15 to 17 bushels per acre in 1903. Within three years the flocks of this State, which had lost 17,000,000 head during the drought, had increased from 23,000,000 to 40,000,000, and the number of cattle and horses had doubled; and by 1905 the number of sheep and of cattle in the Commonwealth exceeded that of 1900.

THE RABBIT PEST

The Australian farmer and ranchman originally had little to contend with in the way of native prolific weeds and predatory animals; but, unfortunately, Australia, like the United States, has suffered from misguided efforts to introduce new species of plants and animals. The cactus finds a congenial home. Its myriad seeds are spread by birds, by wind, and through the involuntary efforts of cattle and sheep. It plays the part of the Russian thistle on our western plains, and, thriving as it does in most any soil and climate, has so far defied the efforts of the bushman who by ingenious systems of burning, burying in pits and poisoning, have courageously attacked the pest.

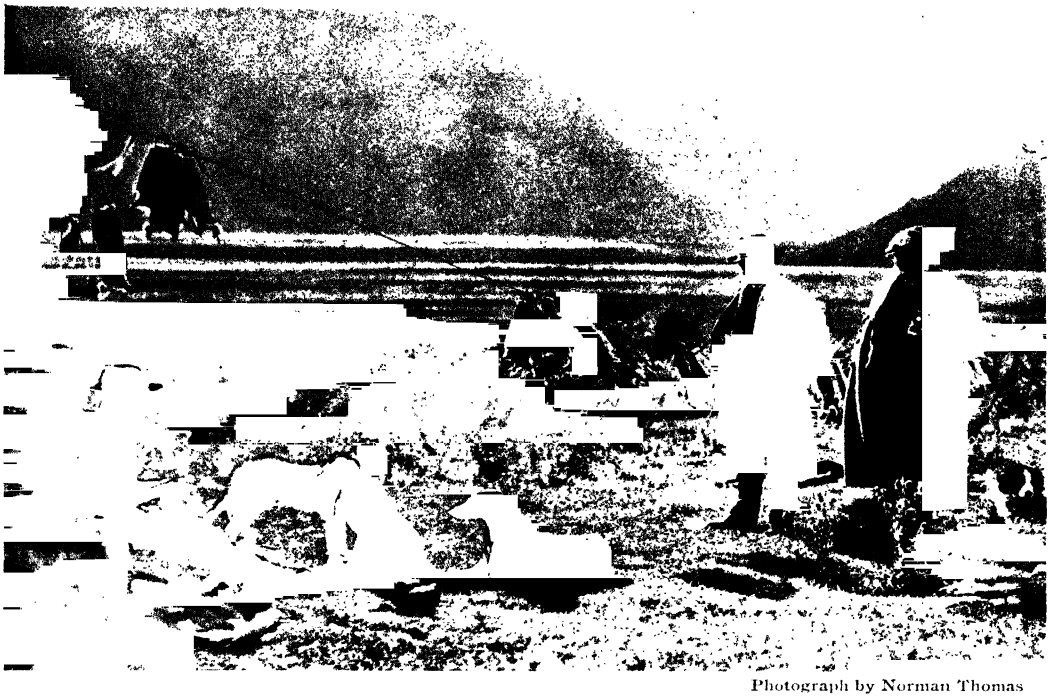
Foxes and also rabbits have been introduced, for the transplanted English squire must have his sport, and the hunting of kangaroos and wallabies and wombats furnish about the same excitement as killing a herd of defenseless buffalo or cornering woodchucks on a New England farm. Foxes have outlived their usefulness; they take an annual toll of about 100,000 sheep, and are now more dreaded than the dingo.

Likewise the enthusiasm with which the harmless-looking rabbits were turned loose has been replaced by sincere regret. The joyous sport of "hunting the hare" has become the discouraging and expensive task of exterminating "vermin." Within a few years after their introduction rabbits were overrunning the country. They appropriated the forage for sheep and cattle and threatened the extermination of the native fauna because of the loss of its food supply. Like swarms of locusts, they swept parts of the country clean of vegetation, destroying the bushes and eating the grass down to its roots. Not only were the agricultural lands and sheep "runs" infested, but vacant land in the suburbs of the cities was honeycombed by these industrious little miners.

MORE THAN 100,000 MILES OF WIRE FENCES BUILT TO CHECK RABBITS

Liberal bounties and wholesale poisoning and hunting with packs of tamed dingos failed to check the spread of the remarkably prolific beast. Hundreds of thousands were killed, but millions were born each year. There was some hope that a severe drought might exterminate them or at least deplete their numbers to the point where a vigorous attack might be successful. It was found, however, that though during droughts their corpses were thickly strewn over "back blocks" and along dry water-courses, they quickly reappeared with the coming of the rains. The introduction of parasites was also without result, and it seemed for a time as if agriculture and grazing were doomed over large parts of the continent.

As a last resort, the scheme of fences, which gives to an Australian land map such an unusual appearance, was devised. As described in the South Australian Act of 1914, the "rabbit-proof fence" is made



Photograph by Norman Thomas

AN AUSTRALIAN RABBIT TRAPPER

An Englishman, moving to Australia, desired to give his farm a homelike air, so he took along some rabbits. They began to spread like the English sparrow in America, and soon the fertile parts of the country were overrun. The rabbit march inland was that of a pitiless vandal army, for, in the dry years, not content with nibbling the grass of the sheep and cattle stations to the point where it would not make goose pasture, they ate it out by the very roots, barked all the trees, and left nothing but blank desolation behind them. Poison was tried, special machines being devised to sow poisoned grain in furrows where the rabbits would burrow for it, but the sheep and cattle would pass it over. But it came nearer to killing off all the birds than it did the rabbits and was abandoned. Now rabbit-proof fences and bounties hold the rabbit plague in check.

of wire netting 3 feet wide, set 4 inches into the ground, and topped by a strand of barbed-wire placed above the netting. A "vermin fence," designed to prevent the encroachment of "rabbits, wild dogs, and foxes and any other animals which the governor, by proclamation, declares to be vermin," is built like a rabbit-proof fence, but reaches a height of 4½ feet and includes three strands of wire at the top. Especially designed gates are used on highways and the penalty for leaving one open is justly severe.

The cost of these fences is enormous, for distances are great, construction is expensive, and they must be continually patrolled and repaired; but the need is imperative and the work has been vigorously pushed. Vermin fences run through woods, cross vacant fields, and stretch far out into the desert. They border stream channels and follow the shores of the great salt lakes, dividing the country into a series of irregular blocks.

The State of South Australia has, since 1891, erected 29,148 miles of fence, enough to encircle the globe and with the remnant build a double line of fence along the southern border of the United States. When contracts now running are completed the mileage will be much increased. New South Wales has expended over $27,000,000 for rabbit extermination and has within its borders 98,000 miles of fence. One of West Australia's fences extends entirely across the continent.

Of late years the rabbit has been repaying in part for his keep — paying board, as it were. He goes to swell the



A RABBIT FENCE ON THE BARKER ROAD NEAR GLEN OSMOND, SOUTH AUSTRALIA

More than one hundred thousand miles of rabbit fences had to be built to put a check to their ravages. It is said that they were once so numerous that three million were poisoned at a single water-hole in one of the drought years. At some places the paths they wore in going down to the Darling River are declared by C. E. W. Bean, author of "On the Wool Track," to be two feet deep (see page 542).



© Underwood & Underwood

TWO AND A HALF TONS OF BUNNIES: TARANA STATION, AUSTRALIA.

The rabbit now has only the poor lands bordering the desert, which it is unprofitable to fence, for his own. But even here the professional rabbit trapper and his dogs assail him. For rabbits are now sent frozen to England, their carcasses for food and their skins for furs and felt.

total of food exports from the Commonwealth. Along the country roads rabbits may be seen hung on the fences awaiting the passage of the rabbit carts which convey them to the packing-houses to be prepared for shipment as frozen meat and hides. Practically all are exported (the Australian does not eat "vermin"), and during 1913 frozen rabbit and hare to the value of $1,400,000 and skins to the value of $3,000,000 were sent from Commonwealth ports.

SAVING A SCANTY RAINFALL

On the assumption that a temperate climate and 20 inches of rain be required for Australian agriculture, there is available for crops only 480,000 square miles, 307,000,000 acres, or 16 per cent of the continent. As thus viewed, Australia for the farmer is somewhat larger than Germany and Austria-Hungary and equal to the combined areas of Louisiana, Texas, Oklahoma, Kansas, Nebraska, and South Dakota (see also page 537).

There remain, however, within the temperate zone 347,000 square miles, or 860,000,000 acres, with rainfall less than 20 inches. How may this enormous area in the temperate zone of good soil and favorable temperature be reclaimed for farming, or at least made available for grazing? As might be expected from the spirit of the Australian people, this prodigious task is being vigorously attacked. Much is being done with dry farming and by the selection of drought-resisting plants; but the hopes of reclaiming desert lands to agriculture are based, as in the United States, on irrigation.

The problems which confront the Australian reclamation engineer are exceedingly difficult. Of mountain ranges suitable for collection of water there is one—a plateau-like affair, 2,000 to 4,000 feet high, with knobs here and there reaching above 6,000 feet, but without important accumulations of snow. The range is so near the Pacific coast that no large belts of agricultural land are found on its well-watered eastern slopes. The task before the Australian is comparable with that involved in irrigating Arizona and New Mexico after the Rio Grande, the San Juan, the Colorado, and the Gila had been eliminated and the mountains now furrowed by living streams reduced to ridge-dotted plains.

One of the world's great irrigation schemes, and the most ambitious yet undertaken by Australia, is the impounding of the waters of the Murrumbidgee, one of the chief tributaries of the Murray. This project, which is rapidly nearing completion, involves the construction of the great Burrinjuck dam—240 feet high, 780 feet long, with a width of 18 feet at the crest. Though its dimensions are less, it is a fair rival of the Roosevelt dam of Arizona, which it resembles in structure and setting. The artificial lake formed at Burrinjuck is 41 miles long.

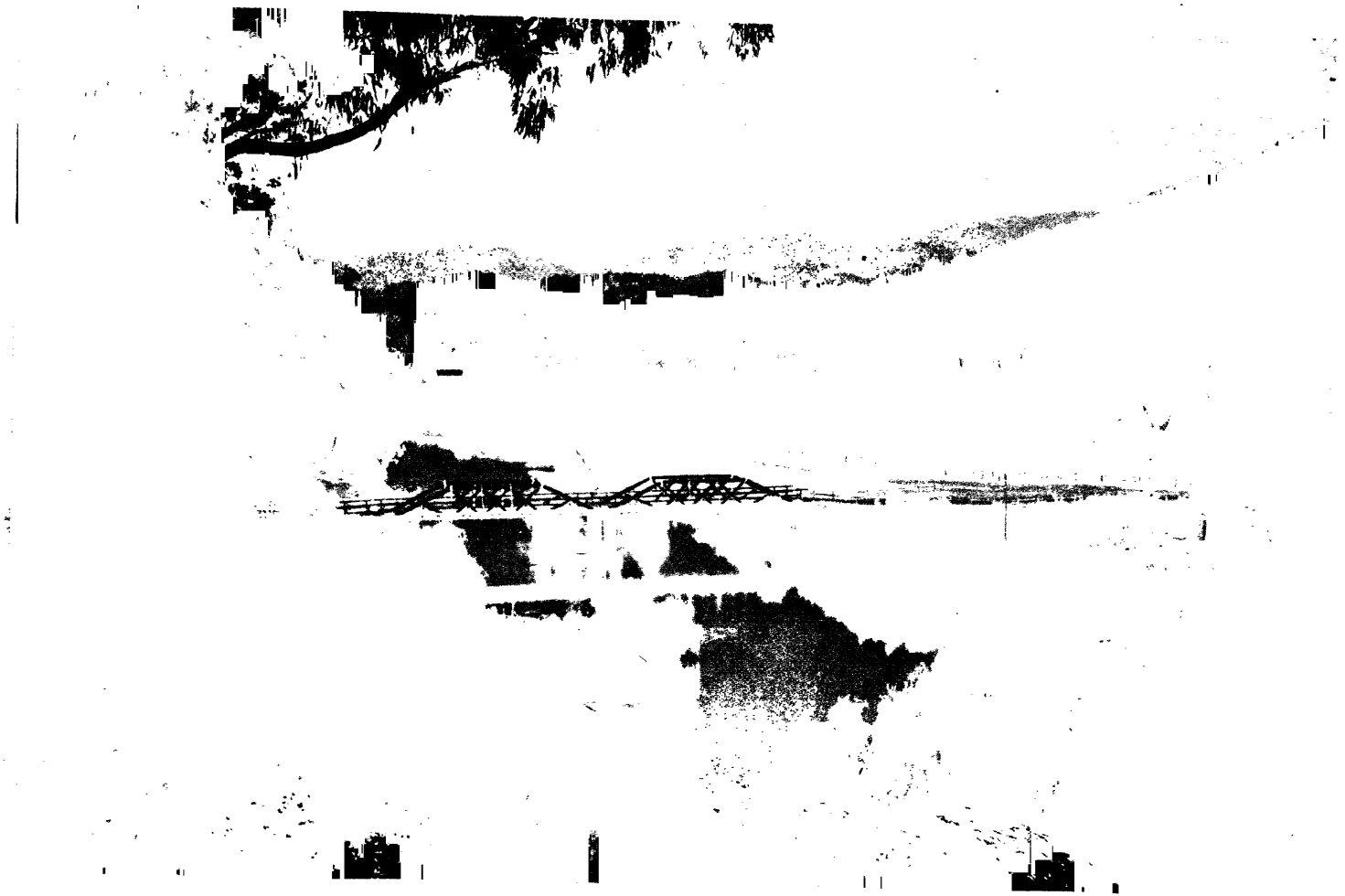
From the dam the water is to be led down the channel of the Murrumbidgee 200 miles to Berembed, where it will be diverted among 250,000 acres of choice farm lands which are now awaiting settlement.

Unlike the American system, which limits governmental control of irrigation projects to the selling of water and land, the government of New South Wales becomes the parent of an irrigation colony. It plans and builds villages, lays out and controls race-courses and athletic fields, builds houses and fences, sells trees and seed and lumber, loans money, stock, and agricultural implements, grants reduced freight and passenger charges on railways, builds and operates butter factories, cheese factories, and canneries, and provides scholarships at the university.

THE LARGEST ARTESIAN BASIN

Beyond the reach of streams from the coastal mountains, the land stretches westward for nearly 2,000 miles without encountering water sufficient for irrigation. Part of this vast area is available for dry farming if domestic and stock supplies can be obtained, and large areas are suitable for cattle and sheep if only water can be found.

Drilling for water in arid regions has revealed the largest artesian basin in the world, covering 499,000 square miles. From this basin New South Wales has obtained 468 flowing wells, ranging in depth from 46 feet to 4,338 feet at the



A FARM IN A SHELTERED VALLEY: TUMUT, NEW SOUTH WALES

Photograph from Boston News Co.

Insufficient moisture prevents agriculture in the greater part of Australia, but where rainfall suffices the land is enormously productive

Boronga bore, which yields over 1,000,000 gallons daily. In this same basin Queensland has 985 flowing wells, 64 of which are classed as yielding over 1,500,000 gallons per day and 6 over 3,000,000; twelve of them are over 4,000 feet deep, and the Bimerah No. 3 was sunk to a depth of 5,045 feet.

Water from these deep wells is naturally hot. Temperatures between 120° and 150° are fairly common, and eight wells of Queensland furnish water above 190°.

The temperature of well water is unimportant, but its quality is a factor of moment, and unfortunately the water from many of the deep wells contain alkali or salt in quantities which render them useless except for stock which have become accustomed to impure water. It is most discouraging to obtain at great expense a well of large flow only to find its waters unfit for irrigation or domestic use. The grip of the desert is felt not only on the surface, but at depths below.

THE PROBLEM OF THE TROPICS

The northern edge of the Australian continent corresponds in latitude to Costa Rica, the coast of Venezuela, and the central Philippines; its southern edge, excluding Tasmania, has about the position of Washington (D. C.), San Francisco, Peking, and central Portugal (see map, page 477). The portion of the continent within the tropics is therefore large—0.386 per cent of the lands of the Commonwealth—but conditions are such that even the Malays have found it less attractive than the more tropical regions farther north.

In the Northern Territory the natural obstacles are too serious to be overcome without capital and expert knowledge. The summer monsoon, caused by overheating of the great desert belt in the center of the continent, brings heavy rains during the three summer months, culminating in January. During this season grass literally bounds up, some varieties attaining heights of 10 feet in three months—so coarse and rank as to be useless for stock—and must be removed by burning. The ground becomes so soaked that traffic is impossible, farming implements are bogged, and river flats with good soil are submerged. These flood conditions are succeeded by drought, and from March to October the monthly rain is measured by fractions of an inch, and in some years fails altogether. On leaving the coast the rainfall rapidly decreases and desert conditions prevail over nearly half of the area within the tropics.

The few settlers in the Northern Territory are making an heroic struggle in this unfavorable environment. Port Darwin, the capital city, on one of the best harbors in the world, is a village of iron houses, with a population of about 1,000, less than half of whom are whites, and the white population of the territory, the size of three Swedens, is about 2,000. It is reached by steamer from Brisbane—an eight to eleven days' journey, and access to the back country is attained by a narrow-gauge road, running trains semi-weekly to Katherine River, 200 miles; by two boats a year, subsidized to visit coastal ports on the Gulf of Carpentaria, and by pack-horse mail, whose going depends upon seasons and the state of roads. The distance inland to the nearest railroad at Oodnadatta is 1,300 miles, and a large part of the cattle are driven 1,000 miles or more to market.

The coast of northern Queensland is truly tropical; its heat and humidity are high. The average annual rainfall from latitude 25° northward is over 50 inches, and for about 100 miles of coast exceeds 90 inches. At Harvey Creek it is 165 inches, and annual falls of 211 inches at Innisfail, 238 inches at Harvey Creek, and 241 inches at Goondi have been recorded. On twenty-two different occasions single downpours exceeding 17 inches have been experienced at various stations. These superabundant supplies furnished by monsoons and trade winds unfortunately are not distributed inland, but are confined to the coast by mountains. More than one-half of Queensland is within the tropics, making an area larger than Central America, Cuba, Jamaica, and Porto Rico combined.

The story of sugar is an important phase of the problem of the tropics. This industry in tropical Queensland was built up by the use of indentured Asiatic and



Photograph by Spurling and Son

BAM BLUFF: NORTH HIGHLANDS, TASMANIA

"Tasmania is blessed with water and escapes the fear of drought ever present in other Australian States (see page 537). The peaks and ridges which everywhere break the surface of the island are rich with minerals. And her people have such abounding faith in the future of Tasmania that they believe she will one day bear to the rest of Australia the relation that England bears to Continental Europe.



PICKING COFFEE: MACKAY, NORTH QUEENSLAND

One usually thinks of Australia as being situated in a latitude as cool as that of our country, and yet three-fourths of its territory lies nearer the Equator than the sugar-cane lands of Louisiana



Photograph by H. E. Gregory

A CHARACTERISTIC "LAKE"—THE BED OF LAKE HART

Kanaka labor. Opposition to the color of the laborers, and more especially to the wage received, led the people of the temperate part of southern Queensland, outside the sugar belt, to object to the employment of non-Europeans, and the political friction engendered led to serious talk of secession. With the formation of the Commonwealth the demand for the elimination of competition with colored races under the guise of the "White Australia" policy was irresistible and the sugar-planters were deprived of their efficient labor and their profits.

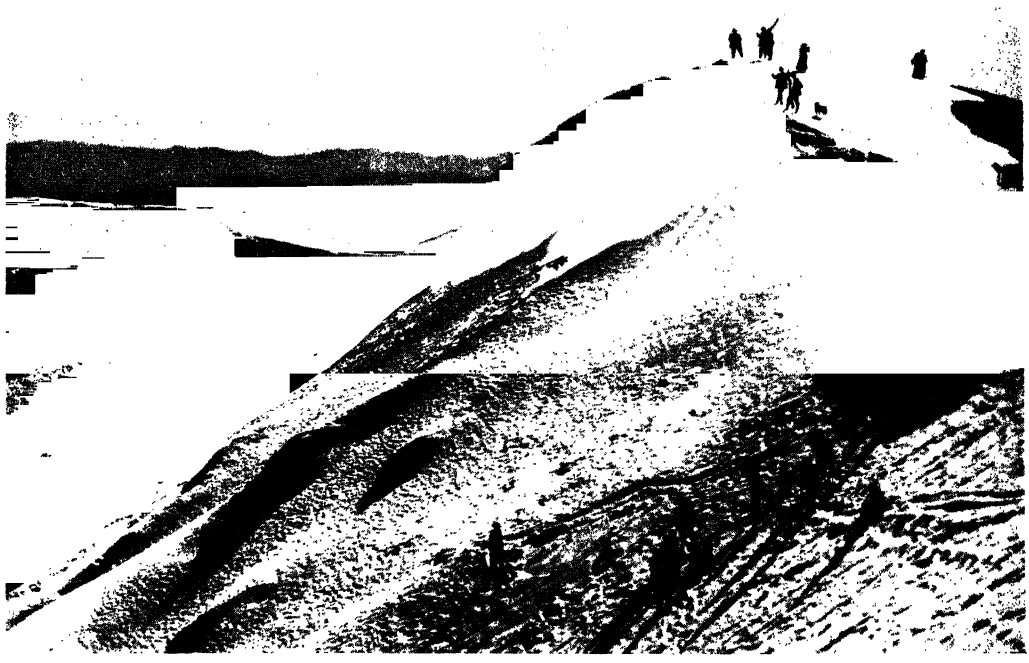
The profits were restored by a bounty granted on condition that white labor be employed and that wages and hours be "fair and reasonable." Bernhard H. Wise states that "for the first five years the cost of this experiment was about $4,900,000." While the tonnage of sugar produced has fluctuated, the acreage of the Commonwealth has remained practically the same since 1902, and the number of persons engaged in the sugar industry has decreased steadily from 46,000 in 1907 to 28,000 in 1912.

The history of cotton, rice, and coffee, for which the climate of Australia appears to be eminently suitable, is similar to that of sugar. In spite of liberal bounties, their production has decreased.

THE DESERT

The Central Desert is the Australians' family skeleton. There is not much said about it at home and the visitor rarely sees it; but it is there, a stern reality, which stands in the way of national development. Other continents have deserts, too; the Sahara is larger and our Mohave and the Painted deserts, as well as large areas in Utah and Nevada, are as barren as the region about Lake Torrens.

It is its enormous area in proportion to the size of the continent which gives the Australian desert its commanding position. More than half of the entire continent receives less than 15 inches of rain per year, and the area receiving less than 10 inches is 1,077,245 square miles—more than one-third of the continent, or more than all the United States east of



MOUNT FEATHER TOP, VICTORIA, IN EARLY SPRING

Snow-capped peaks are rare in Australia, and this view of the high Alps was first seen by the young explorer, Hamilton Hume, who in the early years of the nineteenth century won his way from Sydney across country to Port Philip, where Melbourne now stands. "There was Kosciusko to the southeast, and Bogong, Feather Top, and the Cobbler raising their giant hoary heads in front, and you may be sure the explorers could scarce prepare their breakfast for gazing at the strange scene."

the Mississippi. One station reports eight inches in seven years; another six inches in ten years. In the center of the desert the annual precipitation is less than five inches, and over large areas rain may not fall for a period of several years (see map, page 588).

Large areas are so flat that no feature in sight rises above the level of the eye except the ghost-like ridges suggested by the ever-present mirage, and the portion known as the Nullarbor plain, having dimensions, roughly, 450 miles by 200 miles, is one of the most even land surfaces in the world. Railroad levels across this plain reveal a gradual slope from 329 feet to 605 feet in a distance of 450 miles—an imperceptible rise of about seven inches to a mile and a difference in elevation of any two points 20 miles apart of less than 40 feet (see map, pp. 480-481).

In constructing the Commonwealth railway (from Perth, Western Australia, to Port Augusta, South Australia) there are no obstructions to avoid, no bridges to build, and practically no grading to be done, and for 430 miles in a single stretch the line will be without curves.

A DESOLATE REGION

The Australian desert is not a mythical affair like the "Great American Desert," but is a singularly inhospitable waste, which may be entered only in favorable seasons and by special means of transport. Excluding the miners of the Kalgoorlie region, the population on 800,000 square miles of this area, including ranches and villages along the railways, is estimated by the Meteorological Bureau at "probably not a thousand white folk."



Photograph by C. P. Scott

GOVERNMENT CAMEL TRAIN IN THE DESERT NORTH OF ADELAIDE

The Great Desert of Australia divides the continent into two parts, isolating the people of West Australia as completely as if they were on another island. Camels are now generally used for transportation in this region.

CAPRICIOUS RAINS

Large areas of the desert are unknown, but the wide-spaced tracks of explorers are sufficient in number to reveal its character. The reports of the most recent expedition coincide with those undertaken a half century ago: "We have demonstrated the uselessness of any persons (pastoralists or miners) wasting their time and money in further investigations of that desolate region" (Carnegie).

The annual average rainfall is not only insufficient, but is distributed from year to year and throughout the year in capricious fashion. All the rain of a year may fall in a few hours, or several years may pass without rain enough to wet the ground.

Evaporation on the desert's edge, where tested by measurements of loss in tanks, in New South Wales and at Coolgardie, Western Australia, is at the rate of 85 inches per annum—about that of the lower Colorado Valley. At Laverton it is 146 inches, or more than 12 feet—15 times as much as the rainfall.

Travel through the desert consists essentially in getting from one water-hole to another, a task at which the native excels the European. The aboriginal knows the location and yield of every water-hole within the limits of his hunting ground, and is free to move with the rains. When soaks and gnamma holes fail he digs up mallee roots, from short lengths of which water sufficient for a drink may be obtained. He has also learned that water may be squeezed from the bodies of frogs, which bury themselves in mud during droughts.

CAMELS ARE INTRODUCED

Not until 1862, after many failures, was the desert crossed by horses, and then along the line which has proven to be the only feasible one. Compared with other routes this first transcontinental traverse by Stuart is well watered, and has determined the location of the Adelaide-Port Darwin telegraph line, and of a proposed railway (see map, pages 480-481).

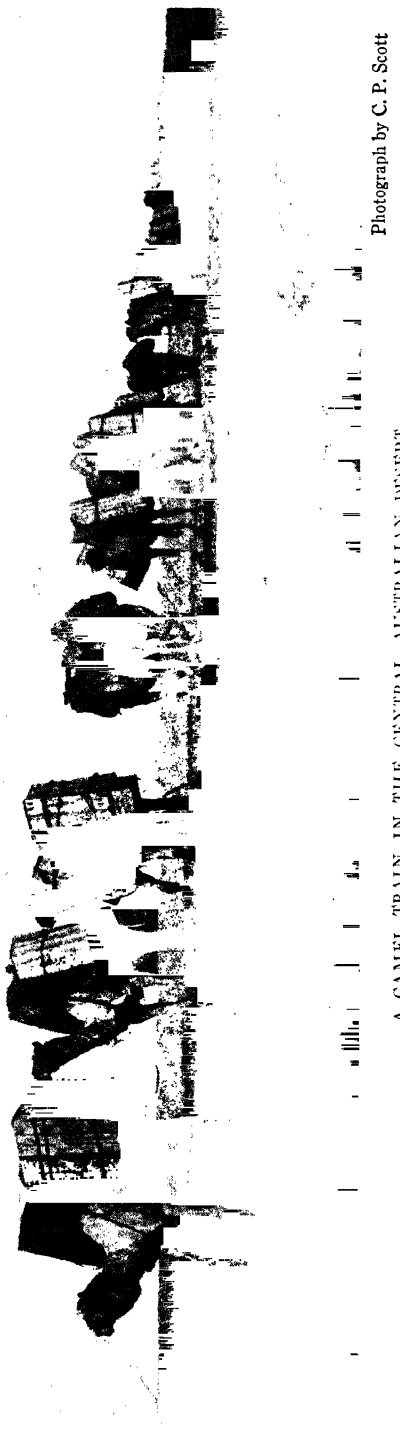
From the termini of railways in Queensland and New South Wales, 2,000 miles westward to the Indian Ocean, camels are the burden-carriers across the waterless steppes. Settlements of Afghans with their camels are familiar sights at mining camps and stations along the railways. They carry wool to market and return with needed supplies. Driven in harness, or saddled, they bear the settler and the mails from oasis to oasis, and take the missionary, physician, and engineer to their work. They are used to haul materials for construction, to bring in fuel, to plow, and to distribute water along routes of travel. The water-supply branch of the West Australia government has 350 camels in use, and 300 are taking part in the construction of the Port Augusta-Kalgoorlie railway (p. 554).

The camel of Australia is not a beautiful or an affectionate beast, but he will browse on desert shrubs and carry a load three or four times that of a good horse 20 miles a day without apparent fatigue. When deprived of water for more than five or six days, his efficiency decreases, but he is capable of work for much longer periods.

On Carnegie's expedition the camels were without water for thirteen and one-half days. On a geological expedition north of Eucla, camels were at one time twelve days without water in an average temperature of 100°. On the Jones Survey across and beyond the Nullarbor plains, camels traveled 340 miles over rock and sand, in fifteen days, without water, and waterless stretches exceeding 600 miles have been covered.

It is no simple matter to fill a camel with water. His ordinary drink is seven to eight gallons; when thirsty, twenty gallons; but after being deprived of water for several days, forty gallons is scarcely enough. His demands, therefore, make great inroads on small water-holes. In desert mining camps, where water is scarce, the drink for a camel may cost $2 or $3, and the owner of "Misery," coming in from a long trip, is said to have paid $14 to quench the thirst of his mount.

At the end of the railway, in South Australia, is Oodnadatta, the most remote village on the continent. Three stores, a hotel, a missionary hospital, an Afghan village, and buildings of the government railway are its principal features. Water is obtained from an artesian well which



Photograph by C. P. Scott

A CAMEL TRAIN IN THE CENTRAL AUSTRALIAN DESERT

yields 270,000 gallons of somewhat salty, hot water a day; for drinking; the rain-water caught on iron roofs is used. Food of all kinds is brought to Oodnadatta by train; the town exists for the purposes of forwarding supplies by strings of camels to far-away ranches and for shipping produce of scattered stations and transferring cattle and sheep in times of drought.

BUILDING A DESERT RAILWAY

A ride on one of the tiny trains which run twice monthly to Oodnadatta, equipped with extra tank cars and water bags for passengers, is dreary enough if one is looking for grass and water and trees. To me the views of sand-dunes and gibber-plains, of the sheet of Lake Eyre, of mirage and dust-storms and distant mesas, constituted features of a fascinating journey.

The Great Desert of Australia divides the continent into two parts, isolating the people of West Australia as completely as if they were on another island. There is no land communication between this State and its nearest neighbor except by telegraph, and the boat journey from Sydney to Perth requires more time than from Sydney to New Zealand and only a little less than from Perth to India.

The Commonwealth has now undertaken the task of providing an overland route from the Pacific to the Indian Ocean. The ordinary engineering problems are so small that the line was laid out by compass; there are no tunnels, deep cuts, or steep grades, and few culverts and bridges are required. Sand-dunes are the greatest obstruction, and the amount of excavation in crossing a belt of dunes 20 miles wide is more than half that required for the whole 1,063 miles of new track (see map, pages 480-481).

The remarkable feature of the railway is its location in a region uninhabited even by aborigines, and where the real task of the engineer is to provide water, grading and track-laying being incidental.

The preliminary surveys for the railway were conducted by camel parties; then well-boring outfits were dragged by teams of 14 or 16 camels over the route or from ports on the coast. Workmen supplied with water by camel-trains were set at work constructing catchment basins



"GETTING ON" IN THE WORLD

Photograph by C. P. Scott

On the long marches through the Australian deserts the wobbly legs of the baby camels sometimes fail them, and they are then given a free ride

and digging shallow wells, but the chief reliance is upon water in tank cars hauled hundreds of miles.

At the eastern end of the line water must be found for 200 horses, 300 camels, and 1,200 workmen with their families, besides that needed for eight locomotives, each one of which uses about 60 gallons per mile, or 60,000 gallons for a 1,000-mile run. Water at the head of rails, carried 300 miles in tank cars and 30 miles by camel, costs $39 a thousand gallons; at one point the cost is $2 a gallon. At the western end of the line, water is taken from pipe 350 miles long, then hauled 220 miles at a cost of $8.40 a thousand gallons for each 100 miles.

PANAMA CANAL IDEAS APPLIED IN THE AUSTRALIAN DESERT

It was interesting to watch the railroad building. The construction camps



Photograph by H. E. Gregory

A BUBBLING SPRING OF SALT WATER: CENTRAL AUSTRALIAN DESERT

near the end of the line have buildings like those on the Panama Canal, with well-equipped hospitals, dining-rooms, and offices. The "tea and sugar train" is continually bringing supplies from the storehouse at Port Augusta, for the daily menu of the highly paid workman includes not only freshly baked bread and fresh meat, but also fresh vegetables and fresh fruit.

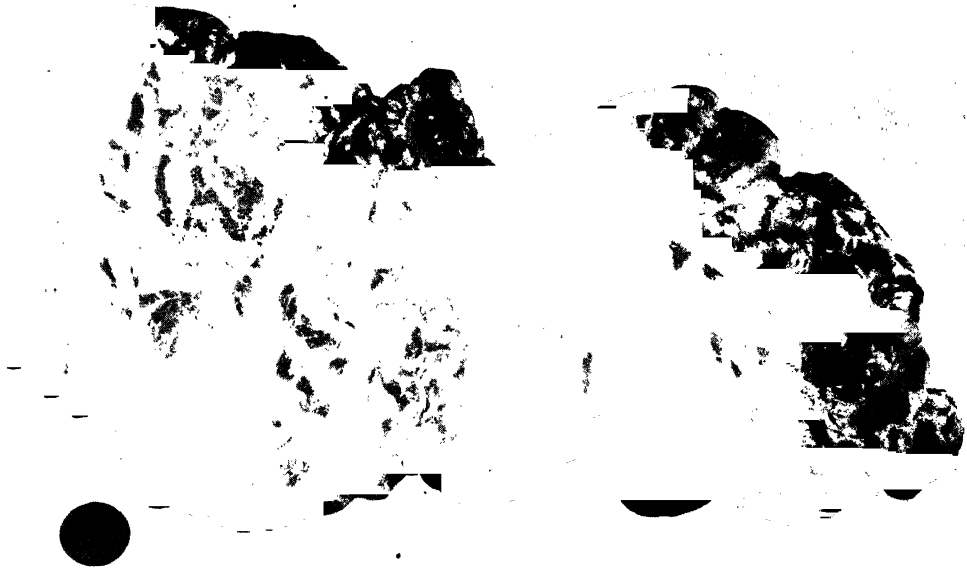
At the end of the constructed track the home-like train is left and a string of thirteen camels carries us on into the desert towards Ooldea and the Nullarbor plains. At Ooldea soak there is water among the sand-dunes and we go into camp, nearly 200 miles from the nearest settlement. Over the 630 miles separating Ooldea from Kalgoorlie travel by motor is feasible after supplies of water and gasoline have been laid down at stated points by camels. There is no road, but the Nullarbor plains are remarkably level and their surface is practically free of sands.

The expected returns from traffic on the Australian transcontinental line are an insignificant fraction of the cost of building and upkeep, but its political and strategic values are immense. It shortens the distance from London to Melbourne or Sydney by nearly a week, and likewise decreases the time between West Australia and New Zealand or America. It brings the western half of the continent in touch with the eastern by converting a strenuous two months' overland journey from Adelaide to Perth into a comfortable ride of two days.

THE ROMANCE OF GOLD AND SILVER

When word reached Sydney early in 1849 that an Australian engineer had found gold in the streams of the Sierra Nevada, the boats to San Francisco were crowded with Australians. One of these amateur miners, Edward Hargraves, was so impressed with the similarity between the gold-bearing rock of California and the rocks along the Macquarie, that he hurried back to Australia and had the satisfaction of startling the peaceful colonies by the discovery of gold in New South Wales in February, 1851. One year later 105,000 men were encamped at three gold centers: Ballarat, 40,000; Bendigo, 40,000; Castlemaine, 25,000.

In 1850 Victoria had a population of 76,000, chiefly stockmen and farmers; by 1855 there were 364,000 inhabitants, three-fourths of them men. During this period Melbourne rose from a town to hold for a time the position of the foremost city in the Southern Hemisphere;



Photograph by C. R. Martin

AN AUSTRALIAN GOLD NUGGET COMPARED TO A $20 GOLD PIECE

The nugget weighed 2,159 ounces when found at Ballarat, Victoria, on June 15, 1858, and was sold for $50,000

parks were laid out; the University, Public Library, and Museum established; the first Australian railway built, and plans for the future knew no bounds.

Reports of panning $100 to $200 per day and of finding nuggets worth thousands of dollars each upset even the most sober-minded. "Farms, shops, ships were alike deserted, not only by men on them, but by their owners and masters. It was shearing time, but there were no shearers; it seemed like that at harvest time there would be no reapers." Even government officers and policemen deserted, and order was kept and offices manned by soldiers brought from Tasmania and from England.

The workings at Ballarat and Bendigo justified the excitement. For the first ten years, 1852-1861, the output was valued at $486,000,000. From the Victoria field have come 412 gold nuggets, each weighing over 100 ounces, 52 over 500 ounces, and 12 over 1,000 ounces. The weight of the "Welcome" was 2,217 ounces and of the "Welcome Stranger," found an inch below the surface, 2,520 ounces, worth $50,000.

Queensland's turn came next. One small field after another was developed, until in 1886 the famous Mt. Morgan mine was opened. This wonderful mine, literally a mountain impregnated with gold, began by paying dividends of $2,000,000 a year. In 1889 the stockholders received $5,000,000, and the dividends for the first twenty years amounted to $35,000,000. Although Mt. Morgan continues to produce $2,000,000 in gold a year and is a leading factor in Queensland's annual gold production of $5,000,000 to $10,000,000, it is in reality a copper mine! The gold constitutes the fringe of a mammoth deposit of copper, with reserves estimated at 7,000,000 tons. In several respects it is the most remarkable mine in the world and ranks next to Broken Hill as a dividend-payer.

Tasmania had her mining excitement with the discovery of tin at Mount Bischoff (1871), followed by the finding of deposits of gold, copper, and silver.



AN OSTRICH CHORUS: PORT AUGUSTA, SOUTH AUSTRALIA

"The young birds are said to be remarkably silent, but the old birds, and especially the males, have a hoarse, mournful cry, which is likened by some to the roaring of a lion and by others to the lowing of an ox."—KNOWLTON

These discoveries had, however, little effect in increasing the population or changing its character. Although this State ranks first in the production of tin, second in silver and lead, and produces over 6,000 tons of copper a year, "it remains what it always was—a group of gardens, farms, wood-lots, and orchards" in the midst of delightful scenery. It is the White Mountain region for Australia.

FABULOUS RETURNS

Broken Hill, in New South Wales, is perhaps the most famous mining district in Australia, noted alike for containing the largest lead-silver mine in the world and for its endless labor troubles. These two claims to fame are closely related, for the richness of the ore bodies and size of the dividends have incited the miners to "get their share." The crude ore runs 16 per cent of lead and zinc and 11 ounces of silver to the ton. From a lode 10 to 300 feet wide and 2 miles long ore to the value of $383,000,000 has been extracted. One of seven shares of the original proprietary syndicate, valued at $500, afterward was quoted at $11,000,000!

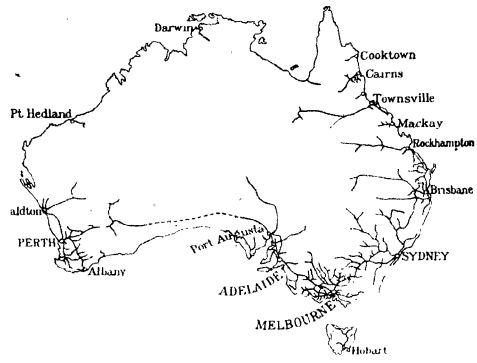
The Broken Hill mines have changed the map of Australia. They support in the desert a city of 33,000 people, a privately owned railway 250 miles in length leading to a port in an adjoining State, and at the end of the railroad the smelter town of Port Pirie, with a population of 15,000.

West Australia was the last of the States to feel the push of mining discoveries, but the impulse came with unusual force. The growth, development, prosperity, legislation, and social character of this State are but the reflections of its gold mines. In 1880 the total population of an area nearly one-third as large as the United States was 29,000, distributed along the coast and engaged in agricultural and pastoral pursuits. But the sensational discoveries at Coolgardie (1892), followed by the almost unparalleled finds a few miles farther on, at Kalgoorlie, within three years doubled the population of the State, and during the twenty years since Hannan made his memorable discovery a population of 48,000 had become 320,000 (see map, pages 480-481).

The mines of the "Golden State" have justified their early promise—they are fabulously rich. Within a few feet of the surface gold in flakes, grains, and nuggets weighing tens of ounces was ready for the finder. In one excavation 8 feet by 5 feet by 4 feet $90,000 was taken, and by the year 1900 seventy tons of gold had been gathered at Kalgoorlie.

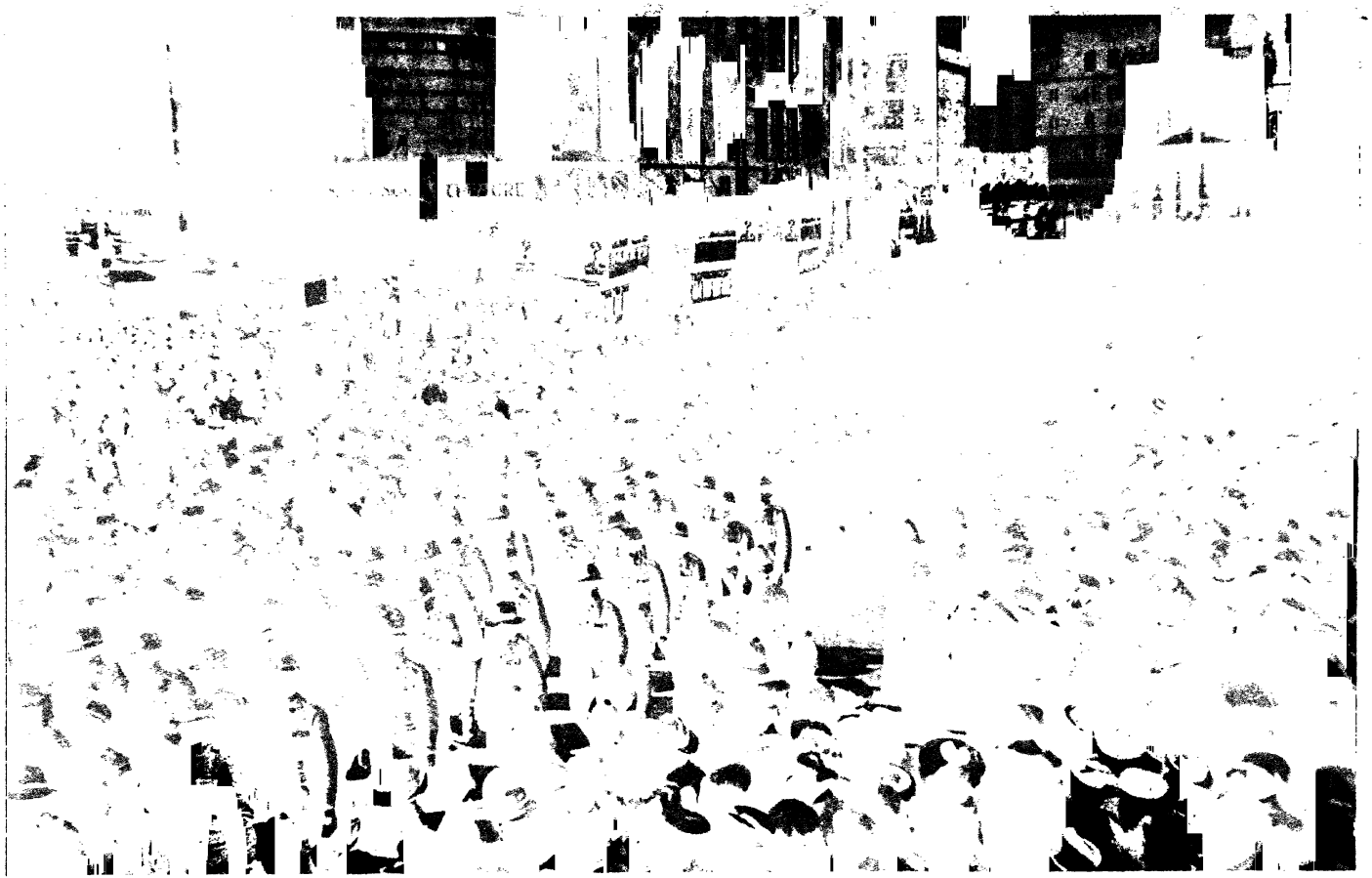
West Australia is the Nevada of the southern continent; Kalgoorlie its Comstock Lode.

The sensational yields of the early days in Queensland, Victoria, and West Australia were largely from surface workings made by pick and shovel; but now ore is mined at Ballarat to depths of exceeding 2,500 feet. At Bendigo thirteen shafts are over 3,000 feet in depth, and the Victoria Reef Quartz Mine reaches a depth of 4,614 feet—probably the deepest gold mine in the world. In West Australia real prosperity began with deeper mining and has continued with slight abatement to the present day.



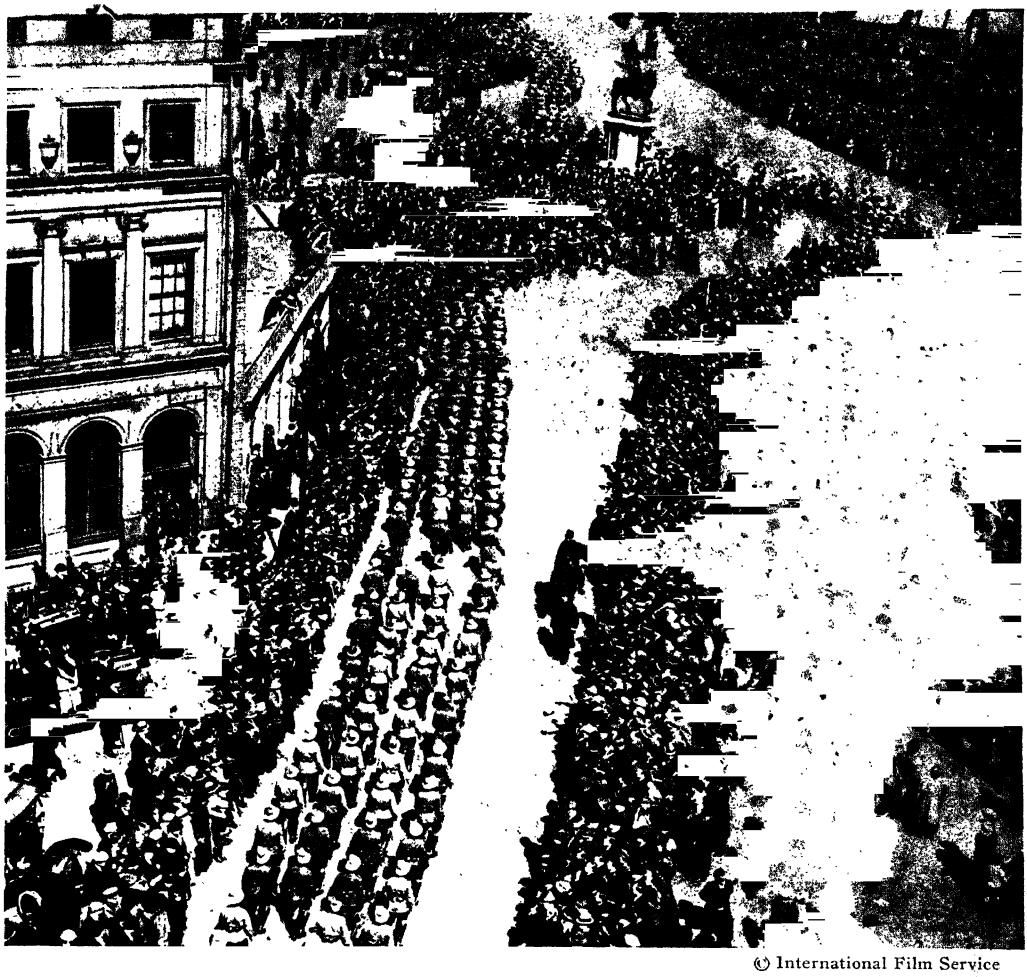
RAILROAD MAP (SEE ALSO PAGES 480-481)

Although the railroads of Australia are largely State owned, there can be very few through routes, for each State has its own gauge track (see text, page 564). It is not likely that motor trucks will ever play a large part in the Australian Desert. The amount of material transported to the back country will always be small, and on account of the scarcity of water and the very high price of gasoline (there is no fuel oil of any sort in Australia), it will be unprofitable to use trucks for transportation. Where a large amount of material is to be handled, as from a mine, an amount too large for camels and too small to justify the construction of a railway, motor trucks will eventually, I believe, find a place. At present automobiles are used in the more thickly settled parts of the country; horses, however, are the chief transportation agents in the humid regions and camels in the arid.



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THE AUSTRALIAN-NEW ZEALAND TROOPS MARCHING THROUGH THE STRAND TO WESTMINSTER ABBEY, LONDON



© International Film Service

A GREAT DEMONSTRATION AS AUSTRALIAN AND NEW ZEALAND TROOPS MARCH THROUGH THE STREETS OF LONDON

Could one read the inmost thought of every individual in that multitude of watchers, what a flood of sorrow and woe the reading might reveal! For London homes that have not sent fathers, husbands, brothers, or sons to make the supreme sacrifice for the Empire are rare.

The Broken Hill mines supply the bulk of the lead, silver, and zinc annually exported from Australia, the zinc until 1914 going chiefly to Germany for the manufacture of munitions. It is not at all unlikely that volunteers from New South Wales have met their death from shrapnel made from zinc and copper which they had previously mined.

For a few years following 1900 Australia ranked first among the world's producers of gold, but with the development of the Alaskan fields and the unparalleled production of the Transvaal she has fallen to third place.

A WATER MAIN 350 MILES LONG

The gold mining camps of Western Australia are in an unmitigated desert—hot and dry. In the early days of the gold fields water was scarcer than gold, and the hardships endured by the early miners and the disastrous endings of some of the prospecting expeditions make a story one would like to forget.

With the discovery of rich gold mines



Photograph by George Bell

AUSTRALIAN TROOPS EMBARKING FOR FRANCE

So long as red blood continues to run in human veins, so long will men continue to pledge their lives, their fortunes, and their sacred honor to the maintenance of what they believe to be their country's rights.

centering at Kalgoorlie, a serious problem was presented. The region is without streams and fresh-water lakes, and wells yield only salt water. The nearest supply in quantity is 300 miles distant. By converting the salt water into fresh with condensers, by utilizing the few soaks, by storing some of the scant rainfall, by hauling water with camels and later by rail, mining operations could be carried on at great expense. When dry blowing of alluvial gold had exhausted the rich surface deposits and the equally rich ledge was encountered, the future profits of the field depended not only upon the amount of the mineral—gold—but also upon the mineral—water.

To meet this situation a most ambitious scheme was undertaken—the construction of a pipe-line from a point near the coast over desert range and valley to supply an artificial reservoir with 5,000,000 gallons a day. The length of the 33-inch steel main pipe is 351 miles—115 miles longer than the Los Angeles aqueduct—and the water is lifted by a series of pumps to a height of 1,290 feet. The cost was great, $5,000,000 for the manufacture of the pipe alone.

The water is sold by the government at an average rate of 75 cents per thousand gallons—a price which seems large to American consumers—but it replaces the wholly inadequate supply of poor water bought at the rate of $8.00 to $12.00 per thousand gallons. Without the Goldfields' pipe line the richest mining fields of Australia with the cities of Coolgardie, Kalgoorlie, and Boulder would revert to their original state—a forbidding desert.

The various State governments advance money to prospectors and to mining companies, drill for metals, coal and oil, erect and operate crushers, testing plants, construct roads, build dams and reservoirs, buy and sell machinery. In Victoria 26 batteries are run at government expense; in West Australia, 40. New South Wales has "grub-staked" prospectors to the sum of over $2,000,000.

The mining towns of Australia emphasize the Australians' love of home and pleasant surroundings. The mushroom city of Kalgoorlie in the land of "sun, sand, sin, sorrow and sore eyes," where water is obtained from the end of a 350-mile pipe, has its gardens and lawns and shade trees.

To an American, whose idea of a mining town is based on visits to Butte or Virginia City, a day in Ballarat, Victoria, is filled with surprises. He walks through clean streets, lined with attractive buildings and adorned with statues, leading to parks and public gardens and on to a beautiful lake. Ballarat has demonstrated the fact that mining town is not synonymous with ugliness and lack of public spirit.

THE IMMIGRATION AUSTRALIA SEEKS

Australia is disappointed that of the four large areas which offer congenial homes for people of European blood,—namely, Australia, Canada, United States and Argentina—Australia alone is passed by, while the other three favored regions are receiving Europeans by hundreds of thousands. She sees the United States receiving in one year (1913) 1,197,892 people from abroad, more than the entire net immigration to Australia for the past fifty-three years, and in another year (1910) enrolling four times as many people born in the United Kingdom as were living in Australia.

The stream of immigrants has been not only small but remarkably fluctuating for individual States and for the Commonwealth, and at times has ceased altogether. For the five years, 1896-1900, the net immigration was only 2,487, and the five years following showed a net loss of 16,793. Since that date net immigration has again increased, and in 1913 reached 55,000.

In countries of large population the rate of immigration is a matter of small account, but a continent of nearly 3,000,000 square miles, with vast undeveloped natural resources, must have people if the financial burdens incident to development are not to be crushing. On June 30, 1914, before the beginning of the European war, the debts of the six States reached the enormous total of $1,550,000,000, or $245 per capita, in addition to a Commonwealth public debt of $93,000,000. These startling totals for a dominion with a population less than New York City, while not directly comparable with the debts of most other countries because much of the money is invested in public utilities, are disproportionate to the population and demand interest charges not easily met.

ENCOURAGING NEWCOMERS

Viewed in the abstract, the advantages offered by Australia to a foreigner are exceptionally good. The climate is healthful, unoccupied land is abundant, and social life is unusually pleasant. But in spite of a vigorous campaign, immigrants do not flock to the Commonwealth. Perhaps, because the land, though practically free, is not really so in the sense of the homesteads in the United States, to which absolute title is obtained by residence; and the available land also requires more preparation than the prairies of Canada before return in crop is possible, while the rainfall is less reliable.

Or it may be that the door for the immigrant is not wide open.

The type of immigrant desired is indicated by the classes to which the States and Commonwealth provide "assisted passages." The South Australian list is typical: "*a*. Agricultural or other rural workers. *b*. Domestic helpers. *c*. Persons whose introduction to the State will not, in the opinion of the minister, cause congestion in the State in any occupation or trade." Even with agricultural laborers "care is taken to limit the supply to the demand."

THOSE WHO ARE NOT INVITED

Agriculturalists who will take up small tracts of new land, and domestic servants, are more than welcome, and to these

money aid is extended, but mechanics and miners, factory operatives and manual laborers, and professional men, are not received with open arms, and may find difficulty in becoming established. The carpenter calls for immigrants, but not for more carpenters; the mason sees no need for immigrants skilled in stone or brick work, and the pick-and-shovel man thinks there are enough of his guild already in the country.

If 200,000 European immigrants, such as land in New York, should arrive at Sydney some year, planning to distribute themselves among the skilled and unskilled trades, to open small shops, and start market gardens, a special session of Parliament might have to be called to deal with the disaster! And, when it is remembered that Europeans desiring to emigrate are in crowded industrial, rather than agricultural communities, and know little and care less for country life of uncertain outcome, there is no occasion for surprise that a call to the farm or to domestic service receives feeble response. Even Australians are drifting to the cities (see pages 513 and 527).

THE AUSTRALIAN COMMONWEALTH

As population increased and industries and communications became established, it was found that the interests of the Australian States were not identical—in fact, were in many respects antagonistic—a condition readily understood when the sites of the colonies are noted (see map, pages 480-481).

It is as if Massachusetts, Pennsylvania, Georgia, Arizona, and Oregon were small contemporaneous colonies, each striving to work out its local problems. It appeared to be the duty of each State to enlarge its power, regardless of the welfare of its neighbor or of the continent as a whole. Even within the States differences developed, and secession was proposed by the tropical portion of Queensland and the mining sections of West Australia.

New South Wales was a free-trade State; the others favored protection; but each State had its own tariff laws. Each State also had its own land laws and rules governing copyright, and its own system of defense and of quarantine. Each State developed its railways without regard to interstate traffic, with a gauge and type of rolling stock which suited its needs.

STATE RATE WARS

The struggle was the most intense between the two most populous colonies, New South Wales and Victoria—in reality between the cities of Sydney and Melbourne. Victoria built railroads to and along the border of New South Wales and agreed to carry wool and produce of New South Wales origin to Melbourne at nominal cost. New South Wales also made ridiculously low rates for freight from Victoria points to Sydney, and Queensland and South Australia were likewise industriously engaged in cutting their neighbors' throats at public expense.

The submergence of national to local interests and the desire to build cheaply and rapidly have resulted in a condition of railway gauges which makes interstate traffic impossible without reloading. New South Wales has a gauge of 4 feet 8½ inches; Victoria, 5 feet 3 inches; Queensland and West Australia, 3 feet 6 inches; South Australia, 5 feet 3 inches, 4 feet 8½ inches, and 3 feet 6 inches. The gauge of the new transcontinental railway is 4 feet 8½ inches. A passenger landing at Brisbane, destined for Perth, must change to a different type of car five times, and even between the two largest cities, Sydney and Melbourne (582 miles)—the distance from Omaha to Denver—no through cars can be operated.

With such jealousies and antagonisms it is not surprising that fifty years of fruitless effort should have preceded federation, or that the constitution finally adopted should give large play to the doctrine of State's rights. The model chosen was, naturally, the Constitution of the United States, in which the States retain such powers as are not specifically delegated to the Federal authorities. The Canadian scheme, in which Federal Parliament is supreme over the provinces, and the South African Union, which is a union only in name, were unacceptable.



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ANZAC TROOPS OFF TO THE FIRING LINE IN FRANCE

Their hearty response to the welcome of the French villagers is full of jollity, even though a thousand Balaklavas rolled into one may be their morrow's lot

STATE'S RIGHTS IN AUSTRALIA

But the Commonwealth government of Australia has a much narrower scope than the Federal Government of the United States. Its chief function is to organize defense, regulate overseas and interstate commerce, establish and collect customs duties (of which three-fourths must be returned to the States), coin money, and operate post-offices, telephones, and telegraphs. The States retain all forms of taxation, control the public lands and rivers, and operate railways. The meteorological service is a Commonwealth department, but geological surveys, mine investigations, irrigation, etc., are State functions. Interstate commissions replace Federal bureaus in dealing with many internal problems.

There is even a greater difference between Australia and America in the scope of governmental action. To an Australian, the Federal, State, and city governments are not organizations designed primarily to preserve order and protect property and maintain civic rights; they exist in order to do the people's business, and have no apparent limitations.

Action by Parliament is the cure-all for public and private ills. The State operates railroads, street cars, ferryboats, water works, electric light plants; fixes prices and hours of labor and wages; makes clothes and machinery; sells fish, meat, dairy produce; exports wines; runs warehouses; supplies seed wheat; builds fences and roads; digs wells; provides insurance; pays hospital bills; loans money to individuals; buys and sells land; runs mining plants.

A GENUINE AUTONOMY MAINTAINED

Not only have the States refused to be submerged in the Commonwealth, but the Commonwealth maintains its independence of the British Government to an unusual degree. Politically and economically, Australia and England are far apart. Appeals to the Privy Council at London are strictly limited, and tariff regulations restricting the trade with the mother country are in force. To the Australian the Commonwealth is a growing nation, which owes its origin, but not its development, to England.

The leaders recognize the fact, obvious to the foreigner, that Australia has its own problems, in the solution of which little is gained by following traditions and customs applicable to a thickly settled manufacturing country with well-defined social strata.

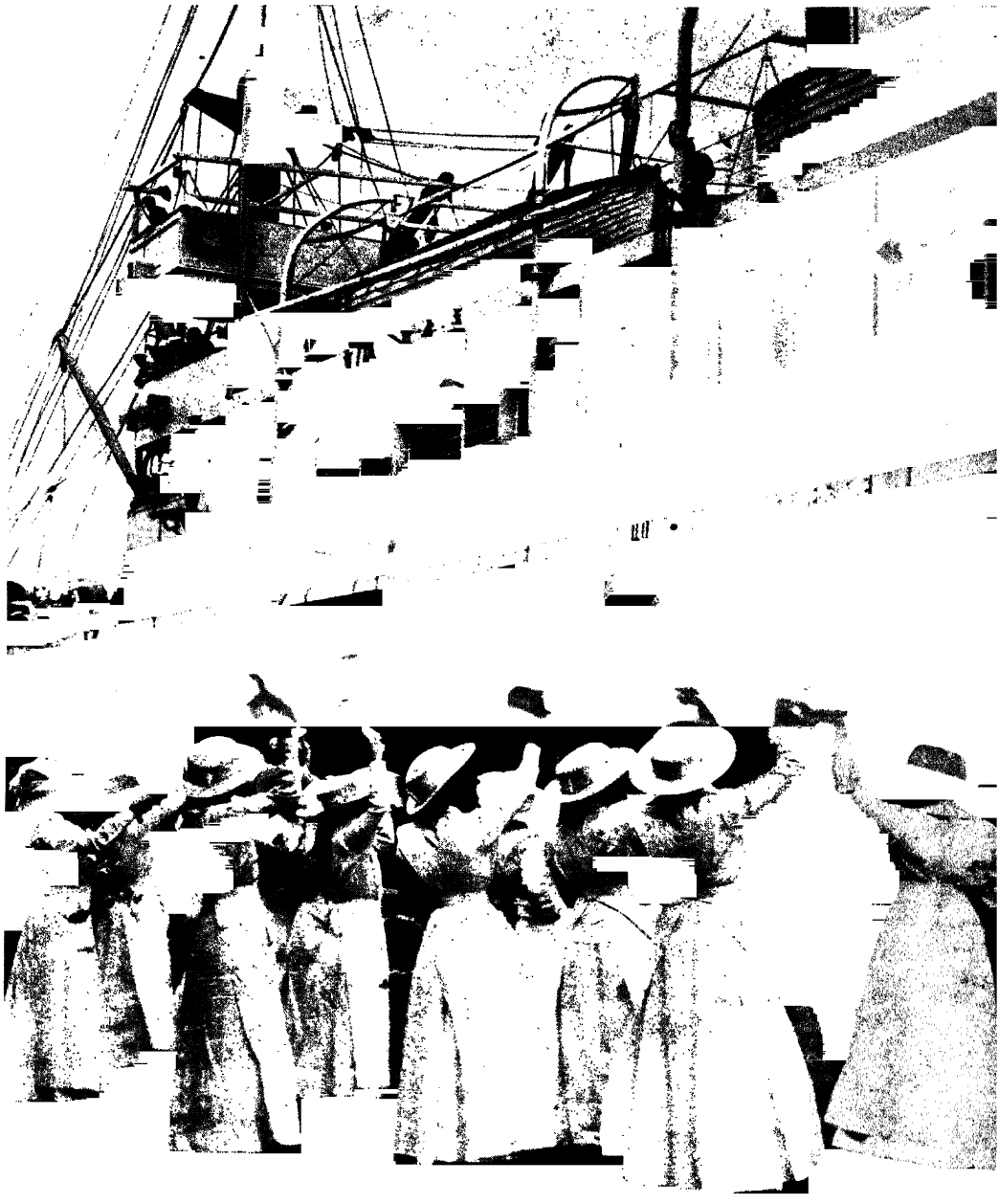
If one were to take at their face value a selection of caricatures and humorous writings, as well as editorials, letters, and pamphlets, printed in Australia during the last quarter of the nineteenth century, he might well reach the conclusion, apparently arrived at by certain of England's enemies, that self-centered and ambitious Australia was little removed from an unfriendly Australia. The fallacy of confusing independence with disloyalty is amply demonstrated by the Boer War and by the Great War.

When by Germany's action Great Britain was placed in a perilous position, the response of Australia was vigorous and immediate. A nation of peace-loving people, intent on their own affairs, was transformed into a group of warring Britons, as it were, over night. It appeared as if the very weakness of the political tie strengthened the bond of allegiance.

PROMPT TO ANSWER THE EMPIRE'S CALL

Within two months after war was declared the little Australian fleet of five cruisers, three torpedo-boat destroyers, and three light gunboats, built and manned at the nation's expense, had occupied the German Pacific islands—Samoa, Marshall, Carolines, Pelew, Ladrones, New Guinea, New Britain—broken up the German wireless system, captured eleven enemy's vessels, forced twenty-five others to intern, and prevented the destruction of a single British ship in Australian waters. In the third month of the war the *Emden*, lying in wait for Australian transports, met its fate before the guns of the cruiser *Sydney*. Later on the watchful Australian fleet played its part in driving von Spree's squadron from the Pacific into the trap set by Admiral Sturdee at the Falkland Islands.

The response of the military forces was likewise quick and effective. Although fighting at a distance involved unusual effort and expense, the task was



Photograph by George Bell

WELCOME HOME: THE RETURN OF THE HOSPITAL SHIP

In all the history of war no colonials ever rendered braver or better service to a mother country than that which Australians and New Zealanders have rendered to Great Britain in her present struggle. From Gallipoli to Arras and the Somme they have covered themselves with glory. And the devotion of the folk back home is worthy of the courage of the men at the front.



Photograph from Paul Thompson

A WARM WELCOME FOR A YOUTHFUL VETERAN

The Australian people are naturally proud of their heroes on their return from the firing line. This photograph shows a wounded Anzac being attended by auxiliary nurses on arrival at the base hospital at Randwick, Sydney.

loyally assumed. Universal military service was inaugurated for the first time by an English-speaking community. Factories were turned over to the government, seventy steamers were requisitioned and rebuilt for transport service, war loans were offered and quickly accepted.

On November 1, 1914, 20,000 men, the entire Australian army at the declaration of war, left Australia for Egypt; at the end of the first year of the conflict 76,000 were in the field, and by July, 1916, "nearly 300,000 volunteers had crossed the seas." The creation, equipment, and supplying of this army, involving enormous cost and personal sacrifice, constitutes a thrilling chapter in the history of loyalty.